NORMATIVE INFLUENCE AND PHYSICAL ACTIVITY

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By

Carly Sarah Priebe

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ABSTRACT

Previous theory-driven research studies in the activity area examining descriptive norms (e.g., Priebe & Spink, 2011, 2012) have demonstrated that these perceptions about others' behaviour can influence individual behaviour. Although the results of these studies are informative, many questions still remain. The studies comprising this thesis add to the extant literature by improving upon methodological limitations of past work, extending the examination of the effects of norms on activity to include both injunctive norms (i.e., perceptions about others' approval) and combined norms (aligned and misaligned), examining other activity-related cognitions (self-efficacy) and behaviour (sedentary), as well as examining characteristics of the norm reference group. Three independent experimental studies were conducted. Study 1 examined the effects of a descriptive norm message on muscular endurance and task self-efficacy in Pilates participants. Results revealed greater endurance and higher task self-efficacy among participants in the descriptive norm information condition as compared to control group participants. Study 2 compared four information conditions: injunctive, aligned descriptive and injunctive, misaligned descriptive and injunctive, and control with respect to their influence on muscular endurance and efficacy in a student population. Individuals receiving the aligned norms had the longest post-condition muscular endurance and greater task efficacy than all other conditions. No differences emerged between the injunctive, misaligned, and control conditions. Study 3, an online experimental field study, examined the effects of descriptive norms on both light activity and sedentary behaviour in an office setting. Study 3 also examined the effects of norms when the reference group differed in personal or contextual similarity. No differences emerged between participants receiving information about groups that varied in similarity. However, after receiving an email with descriptive norm information about co-workers' behaviour, light activity increased and sitting behaviour decreased within the office setting across all conditions. Results from these three studies suggest the following: (1) aligned norms seem to be more effective than misaligned, (2) standalone injunctive norms might not be salient in the activity setting, (3) descriptive norms can impact objective activity behaviour, self-report light activity and sedentary behaviour, and (4) descriptive norms also may inform related cognitive constructs such as task self-efficacy.

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CHAPTER 1
GENERAL INTRODUCTION

The problem of inactivity in western countries such as Canada is a growing concern. In a recent report, only 54% of Canadians were found to be active or moderately active (Statistics Canada, 2012). This is unfortunate as physical activity has been linked to many positive physical and mental benefits such as reduced risk of type 2 diabetes (Lynch et al., 1996), reduced risk of cardiovascular disease (Hu, Tuomilehto, Silventoinen, Barengo, & Jousilahti, 2004), lower risk of osteoporosis (Warburton, Gledhill, & Quinney, 2001), and lower stress and anxiety levels (Paluska & Schwenk, 2000). Further, although many Canadians are not active enough to achieve these health benefits (Cameron, Wolfe, & Craig, 2007), most know that physical activity is linked to positive health outcomes (Craig, Wolfe, Griffiths, & Cameron, 2007). Why are individuals insufficiently active despite their knowledge of the benefits of activity?

There are many possible answers to this question as exemplified by the myriad variables associated with being active (Bauman, Sallis, Dzewaltowski, & Owen, 2002). Of these, one important factor might be the direct or indirect influence of others (i.e., social influence; Turner, 1991). As human beings we do not live in a bubble. The things that other people think, do, and say can influence our own thoughts, feelings, and behaviour. Researchers have been studying the effects of social influence on human behaviour for over a century (e.g., social facilitation effect, Triplett, 1898; Hawthorne effect, Roethlisberger & Dickson 1939). Sherif's (1936) examination of the autokinetic effect and Asch's (1952) classic line experiment also provide early examples of the effect of others' behaviour on individual behaviour. While social influence can come in many forms, the focus of the present dissertation research was on social norms. In the activity area, it is possible that individuals receive normative physical activity messages such as "you ought to be active" and "the majority of Canadians are inactive" on a regular basis; yet, the efficacy of these types of messages on behaviour is not well understood.

1.1 Theories of Normative Influence

Norms have been described as rules that are understood and acted upon by group members without the force of laws (Cialdini & Trost, 1998). Norms can emerge in groups of any size and serve many functions. For example, a group of business associates may establish norms about the appropriate attire and behaviour at their meetings (e.g., Are jeans appropriate? Is it common to crack a joke?). In the activity area, a running group may have a norm regarding

attendance or a norm about who sets the run pace. Activity norms might also emerge in communities where it can be seen as more or less common to use active transportation (e.g., walking or biking) to get to and from work. Further, not only do norms apply in a variety of situations and to a variety of behaviours, these norms can be communicated in a variety of ways. Norms may be explicitly communicated in written or verbal form or they could be implied in less direct ways (e.g., observation).

Several conceptual frameworks have been put forward over the years to explain various types of normative influence. While there are other theories that include a normative component as part of their framework (e.g., subjective norms in theory of planned behaviour; Ajzen, 1991), only a selection of theories whose sole focus is normative influence will be briefly presented.

1.1.1 Social Norms Theory

Social norms theory suggests that an individual will engage in behaviour in an attempt to conform to a perceived norm. This theory also focuses on the idea that perceptual bias often influences how individuals see the world around them (Perkins & Berkowitz, 1986). According to the theory, an individual's behaviour is often influenced by incorrect perceptions about how other people think and act. Perkins and Berkowitz (1986) suggest that by correcting these misperceptions (e.g., often an overestimation about the prevalence of a problematic behaviour such as alcohol consumption), appropriate behaviour change might occur. For instance, on a university campus where students often overestimate the prevalence of drinking behaviour, a message correcting this misperception by indicating that only a small percentage of university students are heavy drinkers could have a beneficial effect on students' alcohol consumption. Research utilizing this theory has focused primarily on alcohol consumption and correcting misperceptions about peer drinking behaviour (Perkins, 2002). The theory focuses heavily on peer influence, most often in youth and young adults, when examining differences between "perceived" and "actual" norms (Perkins & Berkowitz, 1986). While the theory was developed to control alcohol abuse, it has been extended to examine other health behaviours such as drug (Hansen & Graham, 1991) and condom use (Scholly, Katz, Gascoigne, & Holck, 2005). To date, this theory has received no attention in the activity area.

1.1.2 Deviance-regulation Theory

Deviance-regulation theory suggests that the key to understanding whether an individual's behaviour will be influenced by others' behaviour depends on whether that

behaviour is either common (i.e., normative) or uncommon. One of the main tenets of the theory is that behaviours that are perceived as uncommon are more central to one's identity and likely to be acted upon than those that are common (Blanton, Stuart, & Van den Eijnden, 2001). Thus, individuals will self-regulate more based on the perceived social consequences of deviating from a behavioural norm than on the perceived benefits of conforming to a norm (Blanton et al., 2001). In effect, behaviour change is predicted to be more likely to occur when the normative message reports on individuals whose behaviour deviates, rather than conforms, to the perceived norm. For example, deviance-regulation theory would predict that in situations when the majority of others choose to get a flu shot it would be most effective to highlight the negative attributes (e.g., irresponsible) of those minority who choose not to get a flu shot rather than highlighting the positive attributes of the majority who do.

A series of studies by Blanton and colleagues (2001) demonstrated that health communications were most effective at increasing intentions for health behaviours such as flu shots and condom use when they used images associated with deviant behavioural alternatives rather than normative behavioural alternatives. Blanton et al. (2001) highlight that their model best applies when identity concerns are driving decisions (e.g., you are a responsible person if you use condoms or get a flu shot) and that the theory should not be applied to situations where concerns other than identity (e.g., health) are the driving force for behaviour. This may be one possible reason why the theory has not been examined in the activity setting.

1.1.3 Social Identity and Self-categorization Theories

While deviation from common behaviours can confer on individuals a sense of uniqueness and identity, individuals can also gain sense of identity by being part of a valued group. Much of this group focus has come from social identity theory (Tajfel & Turner, 1979), which predicts that perceived membership in social groups contributes to an individual's self-concept. This theory was later extended to self-categorization theory (Turner, 1985), which specifies the operation of the social categorization process (i.e., in-group versus out-group) as the cognitive basis of group behaviour. By socially categorizing oneself and others into in-group and out-group, the perceived similarity of the individual to the group is highlighted. Individuals are no longer represented as unique, but rather as embodiments of the relevant group. According to the developers, self-categorization theory should be viewed as a conceptual component of an extended social identity theory (Hogg & Terry, 2000). Social identity refers to self-descriptions

that are associated with in-group membership. In-group self-categorization illuminates an understanding of social identity processes in intergroup contexts and the ways that individuals might internalize in-group norms as well as align their behaviour with these norms. In terms of normative influence, a group must be salient to an individual in order for the norms of that reference group to have an effect on that individual. This salience is often achieved through similarity. For example, a normative message about physical activity in young females would likely be most effective for an individual who feels similar to the group that the norm is about (i.e., young females).

1.1.4 Focus Theory of Normative Conduct

The focus theory of normative conduct has two main tenets (Cialdini, Reno, & Kallgren, 1990, 1991). The first tenet suggests that it is necessary to differentiate between two types of norms (descriptive and injunctive) when examining the relationship between normative information and individual behaviour. Second, for norms to influence individual behaviour, they must be made salient/focal to the individual.

In terms of the descriptive-injunctive distinction, the authors contend that while both injunctive norms (individuals' perceptions of others' approval or disapproval of a given behaviour) and descriptive norms (individuals' perceptions of the prevalence of others' actual behaviour) can influence behaviour, they do so in different ways (Cialdini et al., 1990). Descriptive norms are thought to motivate behaviour by providing evidence as to what will likely be the best course of action in a given situation. According to Cialdini et al. (1990), "If everyone else is doing it, it must be a sensible thing to do" (p. 1015). In effect, the descriptive norm provides a measure of "social proof" (i.e., we view a behaviour as more correct based on the degree that we see others doing it; Cialdini, 2009). While descriptive norms serve more as a simple heuristic for what tends to be done, injunctive norms require more cognitive processing as actions are based on knowing what others are likely to approve. In effect, injunctive norms involve a component of moral approval or disapproval. Cialdini et al. (1990) explain that these injunctive norms specify what "ought to be done" and guide behaviour through potential social sanctions. While these two norms might act simultaneously in many situations (e.g., what is approved of, is often what is typically done), Cialdini and colleagues highlight that they are distinct.

Further to differentiating between types, Cialdini et al. (1990) believe that normative influence is dependent upon the salience of these norms in any given situation. According to these researchers, if a norm is made more salient, it will be more likely to impact behaviour. For example, in a study of littering, a norm that was provided in an environment that drew participants' attention to the norm (e.g., had a single confederate litter in an otherwise clean environment) was most effective at influencing participants' behaviour when compared to a condition that included a clean environment with no confederate (Cialdini et al., 1990). In addition, in situations where both descriptive and injunctive norms are present (and possibly conflicting), it is suggested that behaviour change will be influenced to a greater extent by the more salient norm. Finally, research is emerging to support the possibility that salience, in the form of similarity, can come in different forms (i.e., contextual and personal; Goldstein, Cialdini, & Griskevicius, 2008). The majority of research utilizing the focus theory of normative conduct has been in the area of environmental conservation (e.g., Cialdini et al., 2006; Reno, Cialdini, & Kallgren, 1993; Schultz, Nolan, Cialdini, Goldstein, & Griskevicious, 2007; Schultz, Khazian, & Zaleski, 2008).

1.2 Theoretical Framework for the Dissertation

Cialdini and colleagues (1990) focus theory of normative conduct (also called focus theory) was chosen as the guiding framework for this set of studies for the following three reasons. First, focus theory considers the uniqueness of descriptive and injunctive normative influence. In addition to Cialdini et al. (1990), others have highlighted the importance of distinguishing between these two types of normative influences (e.g., Manning, 2009; Rimal, 2008; Rivis & Sheeran, 2003). It is possible that research neglecting the distinct influence, as occurs when descriptive and injunctive norms are aggregated (e.g., theory of planned behaviour, Ajzen, 1991; social identity theory, Terry & Hogg, 1996), might confound the influence of norms on behaviour. Differentiating between descriptive and injunctive norms in the current research might help to avoid misrepresenting the effects of norms on activity and lead to a better understanding of normative influence in the physical activity area. Specifically, as the motivation for each type of norm is different (i.e., follow the crowd vs. engaging in a behaviour based on social sanctions), it is possible that descriptive activity norms encouraging following the crowd will have a different effect than injunctive norms suggesting potential social sanctions.

A second reason to utilize this theory is that it introduces the important concept of salience. Salience, as captured in the form of norm reference group identity/similarity, was considered a central part of all studies in the current dissertation, and examined specifically in the third study. A third reason to use the focus theory is that it has served as the theoretical underpinning for some recent activity studies (e.g., Priebe & Spink, 2012) that were predecessors of the present research and serve as empirical background.

1.2.1 Complementary Theories

In addition to Cialdini and colleagues' (1990) focus theory (Cialdini et al., 1990), social identity perspective was also used in a complementary fashion to inform the hypotheses of this dissertation. The concept that a norm reference group must be salient to an individual in order for the norms of that reference group to have an effect on an individual (Terry & Hogg, 1996), complements Cialdini and colleagues' (1990) rationale that descriptive and injunctive norms must be salient to have an effect. As Cialdini et al. (1990) predict that more salient norms will have a stronger effect; it is possible that norms about more similar reference groups are more effective. There are many benefits of utilizing theories in a complementary fashion (Brawley, 1993). As such, the first two studies of this dissertation attempt to control for group identity while the final study investigates the possible effects of more or less salient groups.

1.3 Focus Theory and Activity Research

Emerging evidence has suggested that the perceived prevalent behaviour of others is related to individual physical activity (Priebe & Spink, 2011, 2012). In one correlational study, descriptive norms were the strongest predictor of activity (Priebe & Spink, 2011) in spite of being rated as less motivational than personal reasons for being active (e.g., health, appearance). Of note, however, is that the relationship was only present when "friends" were the reference group suggesting that norm effectiveness may have something to do with the salience of the reference group to the respondent (Terry & Hogg, 1996). In a similar study conducted in a sports setting, the correlation between descriptive norms and friends' behaviour was detected again. Also, group identity was examined and found to be highest with a friend group compared to other relevant groups (Robinson, Priebe, Spink, 2011).

In another study exemplifying the influence of the reference group, a positive correlational relationship was found between normative messages about the popularity of yoga (i.e., a descriptive norm) and self-efficacy to practice yoga. This relationship was detected when

participants' group identity with the reference group was high (Rimal, Lapinkski, Cook, & Real, 2005).

Experimental research findings are also instructive. In an experimental study, messages conveying descriptive norms increased activity in an office worker population, but not in a student population (Priebe & Spink, 2012). Specifically, descriptive norm messages about the stair use of co-workers increased stair use in office worker participants significantly more than did messages promoting stair use for health, appearance, or control reasons.

1.4 Gaps in the Literature

1.4.1 Salience and Group Identity

While the previous results concerning social norms in the activity realm are promising, they are limited and many questions remain unanswered. One concerns the salience of the norm reference group. As mentioned, the correlation between descriptive norms and activity behaviour found by Priebe and Spink (2011) was only present when the reference group was friends and not other university students. Findings in other areas also reveal a stronger effect of descriptive norms for friends when compared to norms about more general groups (Campo et al., 2003; Polonec, Major, & Atwood, 2006). What is it about friends that might lend itself to stronger normative influence? It is possible that the salience of a norm reference group in the form of similarity could be an important factor. Similarity was not measured in the Priebe and Spink (2011) study, but friends have been found to be higher in group identity, a measure of group similarity, in other studies (e.g., Robinson et al., 2011).

Salience in the form of identity with a reference group might also help to explain why a descriptive norm manipulation was successful with office workers while norm messages about university students were not effective at increasing university students' activity beyond other messages (Priebe & Spink, 2012). While there are a number of possible reasons why there were differences between the office workers and the university students, one suggested possibility was that identity (i.e., similarity) with the norm reference group was lower in the university students (Priebe & Spink, 2012). Similarity with a reference group (Terry & Hogg, 1996) deserves further examination in physical activity.

1.4.2 Examining a Cognitive Correlate

Also missing in the social norm/activity literature is the examination of other outcomes that reflect both norms and activity. One possibility in this respect is efficacy (Bandura, 1997).

Bandura (1997) suggests that efficacy, a person's beliefs in his or her capabilities, can be influenced through four sources; mastery experiences, which capture past successful experiences, verbal persuasion, which can refer to encouraging comments, physiological/affective states, which may be targeted through positive emotions or physical feelings, and vicarious experiences. which could be achieved through witnessing or hearing about the successful experiences of similar others. It is possible that descriptive norms inform efficacy by providing a vicarious experience, one of the sources of efficacy identified by Bandura (1997). For example, individuals might perceive many similar others engaging in a behaviour and think, "If they can do it, maybe I can do it". As task self-efficacy also has been associated with activity performance (e.g., Focht, Rejeski, Ambrosius, Katula, & Messier, 2005), and there is one study suggesting a correlational relationship between descriptive norms and efficacy (Rimal et al., 2005), it would seem to be an appropriate outcome to examine.

1.4.3 Aligned and Misaligned Norms for Activity

While research examining descriptive norms for physical activity is emerging, injunctive norms, the other type of norm identified in Cialdini et al.'s (1990, 1991) focus theory, has received no attention in the activity area. Injunctive messages such as "you ought to be active" are often promoted by health professionals or the media but their effectiveness remains untested. Thus, investigating the efficacy of this type of norm message is an important research direction.

As different norm types can be present in a given situation, examining the combined effects of descriptive and injunctive norms also might be fruitful. In the public health domain, the message that "you ought to be active" is often paired with a conflicting message (e.g., "but many people are not active enough"). So while Canadians are receiving an injunctive norm about activity, they are also often receiving a mismatched descriptive norm about the low number of people engaging in that same behaviour (i.e., a misaligned normative message). Based on findings in other areas, it is plausible that this misalignment has a negative effect on activity (Smith et al., 2012). Further, studies investigating other behaviours have found that aligned norm messages (with matched injunctive and descriptive norms) result in stronger effects than either norm alone (e.g., Cialdini et al., 2006). The effects of aligned and misaligned norm messages on physical activity behaviour have yet to be examined.

1.4.4 Methodological Limitations

Finally, the existing literature has three major methodological limitations. For example, the existing research investigating the effects of descriptive norms on activity is limited to self-report behaviour and may suffer from the typical problems associated with measuring behaviour in this way (e.g., issues of accurate recall, possible social desirability bias; Baranowski, 1988; Sallis & Saelens, 2000). In addition, as norms in previous activity research were not relative to one's past performance, the potential for a boomerang effect exists (i.e., individuals already engaging in a behaviour decrease behaviour to comply with a lower norm; Schultz et al., 2007). Finally, norm perceptions have not been measured in previous research, which limits investigators' understanding of the effectiveness of normative messages in changing individual's thoughts and subsequent behaviour (Rimal, 2008).

1.5 Purposes

Based on the gaps in the current literature, the multiple purposes of the current research were to advance the examination of the influence of norms on activity and test principles of the focus theory of normative conduct by investigating the:

1. effects of descriptive norms on both objective and self-report activity-related behaviour in prospective experimental studies (Studies 1, 2, & 3);
2. relationship between descriptive norms and other activity- or health-related outcomes (i.e., self-efficacy, Studies 1 & 2, sedentary behaviour, Study 3);
3. effects of injunctive norms on activity (Study 2);
4. possible additive effects of injunctive norms when combined with a matched descriptive norm (i.e., aligned) or the negative effects of a mismatched injunctive and descriptive norm (i.e., misaligned; Study 2);
5. effects of personal and contextual group similarity with a norm reference group on the descriptive norm-activity relationship (Study 3).

These purposes will be examined in three experimental studies. Using Pilates studio clientele, the effect of descriptive norm messages on muscular endurance behaviour as well as the effect of descriptive norms on task self-efficacy will be examined in Study 1. Following a similar procedure, Study 2 will examine the effect of injunctive, aligned (matched injunctive and descriptive), and misaligned (mismatched injunctive and descriptive) norm messages on muscular endurance behaviour and self-efficacy of university students. Study 3, examined the

effects of descriptive norm messages sent via email on sedentary and activity behaviours of office workers. Also included in the third study will be an examination of the importance of the norm reference group and salience of that group by varying personal and contextual similarity.

In addition to examining novel conceptual questions, these studies advance the existing literature by attempting to address the methodological limitations of the existing literature identified in the previous section.

CHAPTER 2
STUDY 1: DESCRIPTIVE NORMS, EFFICACY, AND OBJECTIVE ACTIVITY

2.1 Introduction

While there are many influences on an individual's activity behaviour, it has been known for some time that the direct or indirect influence of others (i.e., social influence; Turner, 1991) can have a powerful effect on activities that individuals select, and the duration and the intensity in which they engage in those activities (e.g., Prapavessis & Carron, 1997). While the subject of some debate historically, in recent years it has been become more accepted that social norms are truly a 'lever of social influence' (Goldstein & Cialdini, 2007) that guide people's actions.

Norms have been described as rules that are understood and acted upon by group members without the force of laws (Cialdini & Trost, 1998). While norms take many forms, two of these are captured in the focus theory of normative conduct - injunctive and descriptive (Cialdini, Reno, & Kallgren, 1990). Injunctive norms relate to an individual's perceptions about others' approval or disapproval of behaviour while descriptive norms capture perceptions about the actual behaviour of others.

There is growing body of evidence to support the notion that perceptions of how others typically behave (i.e., descriptive norms) are related to individual behaviour in a variety of settings. For example, descriptive norms have been related to important individual behaviours such as alcohol consumption (Real & Rimal, 2007; Rimal, 2008; Rimal & Real, 2005), environmental conservation (Lapinski, Rimal, DeVries, & Lee, 2007; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008), and sun-protection (Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008). In a meta-analysis examining descriptive norms and multiple behaviours, Rivas and Sheeran (2003) reported a consistent positive relationship between descriptive norms and intentions/behaviour.

In the activity setting, there is emerging evidence to suggest that perceptions about the prevalent behaviour of others also positively relate to the self-reported activity of individuals. For example, norms about friends' physical activity has been correlated with individual activity in both university and office settings (Priebe & Spink, 2011). Further, using an experimental study, descriptive norms were found to relate to individual behaviour in office workers, with

workers increasing their own stair use in response to email messages about their co-workers' behaviour (Priebe & Spink, 2012).

2.1.1 Limitations of Previous Research

While results of these previous studies in the activity area are promising, the extant research is limited in a number of ways. First, the exclusive use of self-report to capture overall activity or activities of daily living suffers from the typical problems associated with any self-report measure (e.g., issues of accurate recall, possible social desirability bias; Baranowski, 1988; Sallis & Saelens, 2000). To eliminate potential issues associated with self-report, the current study used objective performance on a muscular endurance task as the outcome. By using an objective, controlled task, the effects of previous learning that might moderate estimates of self-report behaviour were minimized.

Second, the normative messages concerning the activity levels of others used in previous studies were generic messages generated for the purposes of the study. Being generic (e.g., 75% of students use the gym at least once per week), they did not take the participant's previous activity behaviour into consideration. Given that normative messages work ostensibly because they change the target's (mis)perceptions regarding the prevalence of behaviour (Campo, Cameron, Brossard, & Frazer, 2004; Rimal, 2008; Schultz et al., 2007), failure to take into account the target's own pre-message behaviour (i.e., is it actually lower than that presented in the normative message?) leaves the interpretation of any results wanting. This issue was addressed in the current study by having participants first perform the behaviour, then crafting the normative message that was delivered to be higher than the participant's previous behaviour. Having a pre-assessment of behaviour also allowed the creation of a believable normative message as the message was seemingly based on actual collected data from the same sample.

In addition, in previous research the possibility existed that the individual's own past behaviour may have equaled or exceeded the behaviour featured in the message. For example, in Priebe and Spink's (2012) experimental study, regardless of their initial behaviour, all participants received a message that others took the stairs 4 times a day. It was possible that individuals may have already been taking the stairs 5 or more times. In cases such as this, the message could have been interpreted as, "I'm doing more than the rest, so maybe I should do less". And, in fact, this is what has been found in previous studies in other areas examining this circumstance (termed "boomerang effect"; Schultz et al., 2007). This was an important

consideration, as differences in pre-manipulation activity levels may have accounted for the differing results between a student population and an office worker population found in previous experimental research. Specifically, the increase in stair use in response to normative messages about others found in the experimental study by Priebe and Spink (2012) was only present in an office worker population and not in a student population. Given that students often navigate stairs with some regularity when changing classes, it is possible that they already used the stairs more than the norm presented in the messages.

Further, existing research has failed to measure norm perceptions. Descriptive normative manipulations are thought to work by altering individuals' perceptions about the typical behaviour (Campo et al., 2004; Rimal, 2008). For example, if an individual has a perception that most others rarely engage in strenuous activity, they may believe they "fit in" by only being active at an easy intensity. Providing this individual with a message that the majority of other people actually engage in strenuous physical activity might change their perception and resultant behaviour as the individual tries to comply with the "new norm". To ensure that normative information in messages differs from pre-manipulation perceptions, the current research included an assessment of norm perceptions.

Another way that this research builds upon previous literature concerns the consideration of other outcomes that might relate to norms and behaviour. While there is evidence that norms do affect behaviour (Mahler et al., 2008; Nolan et al., 2005; Polonec et al., 2006), less is known about the how this effect might occur. Cialdini and colleagues (1990) suggest that descriptive norms might influence behaviour by providing a decisional cue (i.e., perceiving that many others engage in a behaviour might provide individuals with information about the appropriate behaviour in a given situation). Thinking of behaviour such as a standing ovation at a concert, it makes sense that individuals would look to those around them in order to gain information about whether to stand. When it comes to physical activity behaviours, individuals likely also look to others' behaviour to gain information. However, as specific activity behaviours can sometimes be challenging, it is possible that descriptive norms also influence activity behaviour indirectly through other variables. One possible variable that relates to both descriptive norms and behaviour, and might play a role in challenging situations, is task self-efficacy.

In efficacy theory, Bandura (1997) suggests that self-efficacy, which is a person's beliefs in his or her capabilities, can be increased through four sources (mastery experiences, verbal

persuasion, physiological/affective states, and vicarious experience). For example, in an exercise setting, an individual's task-self-efficacy might be increased if that individual has a successful experience with a task (i.e., mastery), another exerciser comments that the individual is doing well on that task (i.e., verbal persuasion), the individual observes similar others having success on the task (i.e., vicarious experience), or the individual feels happy or proud while completing the task (i.e., affective states). As information about the prevalence of similar others performing a challenging behaviour could possibly provide a vicarious experience, it is plausible that descriptive norms affect efficacy perceptions. For example, an individual may hear a normative message that the majority of similar others persevered on a physical task even though they were tired, and think, "If they can do it, I can do it". To date, one study exists supporting a correlational relationship between self-efficacy and descriptive norms (Rimal et al., 2005). Specifically, Rimal et al. (2005) included self-efficacy as an outcome variable in a study of descriptive norms for practicing yoga, and found support for a positive relationship between descriptive norms and self-efficacy. Further investigating this link would be important from a practical perspective as task self-efficacy has been found to be an important correlate of activity performance (e.g., Focht et al., 2005).

2.1.2 Purpose

Based on the gaps in the existing literature, the purpose of the current study was to use a two-condition experimental design to examine the influence of descriptive norm information on both physical performance and task self-efficacy in a muscular endurance activity (operationalized as a plank hold task). Using a pre-post design, participants in a descriptive norm condition received a normative message between their two muscular endurance tasks indicating that a majority of others had held their second plank longer than their first while those in a control did not.

2.1.3 Hypotheses

Based upon the principles of focus theory (i.e., descriptive norms would impact behaviour; Cialdini et al., 1990) and earlier evidence (Priebe & Spink, 2011, 2012), it was hypothesized that, after controlling for initial behaviour, post-manipulation muscular endurance would be higher in a descriptive norm condition than in the control condition. Second, based on Bandura's efficacy theory (1997) and preliminary findings in the normative literature (Rimal et

al., 2005), it was hypothesized that post-manipulation self-efficacy would be highest in the descriptive norm condition, after controlling for initial levels.

2.2 Method

2.2.1 Participants

Adult participants were recruited from a local Pilates studio ($N = 68$). To control for a potential learning effect, only participants who had previous experience performing a plank hold exercise were included in this study. After reviewing the initial volunteer pool in terms of inclusion/exclusion criteria (i.e., prior plank hold experience and a "no" answer to all PAR-Q questions), 68 participants made up the final sample for this study.

The mean age of participants was 40.4 years ($SD = 11.9$). Consistent with the typical profile of Pilates clientele, the majority of the participants were female (87% - female = 59, male = 9). Mean years of Pilates participation was 1.8 ($SD = 2.1$), and most participants were registered in beginner or intermediate level classes. In terms of overall activity levels, the mean score on the Godin Leisure-Time Exercise Questionnaire was 44.8 ($SD = 27.2$), indicating the sample was moderately active and possibly experiencing some health benefits as a result (Godin, 2011). All participants were screened for activity participation readiness using the physical activity readiness questionnaire (PAR-Q; CSEP, 2002).

2.2.2 Procedures

Ethical approval for this study was obtained from the University Ethics Review Board. After gaining permission from class instructors, a researcher visited Pilates classes to invite clientele to participate. Interested adult participants signed up for an individual 15-minute time slot to complete the study. Through random number generation, participants were randomly assigned to either a descriptive norm (n=34) or a no-message control (n=34) condition. They were provided with the cover story that researchers were collecting data to create norms for a muscular endurance exercise, and that they would be asked to perform two timed maximal plank hold exercises separated by a 3-minute rest period. Participants were told that these muscular endurance times would be averaged.

For an overview of procedures, please see Figure 2.1. At the start of their 15-minute time slot, participants completed the consent form (Appendix A), the PAR-Q (Appendix B), and the initial survey assessing demographics (age, gender, Pilates level, and self-reported physical

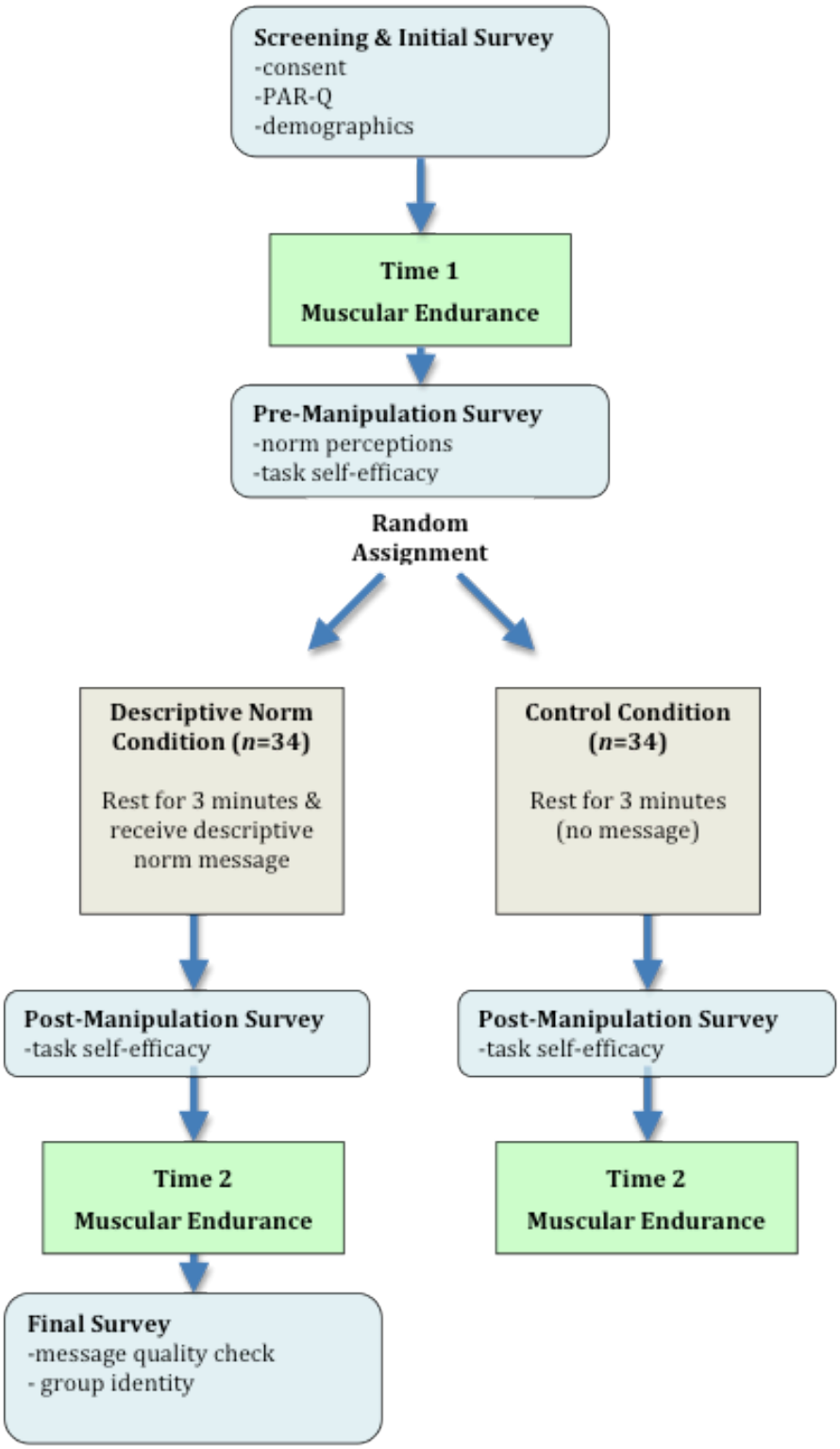

Figure 2.1 Outline of Study 1 Procedures

activity; see Appendix C). They were then asked to perform their first of two-timed standard plank hold exercises to the limit of endurance in a prone position.

Upon completion of the first plank hold, participants immediately completed a task self-efficacy measure relating to the second plank hold as well as a normative perception question (see Appendix D). Following this, those in the descriptive norm condition received a verbal message stating that 80% of similar others (i.e., same age range, gender, and Pilates level) held their second plank for at least 20% longer than their first plank. Those in the control received no message. In order to determine the effect of the message on task self-efficacy, with 30 seconds of rest time remaining, participants were told, "Now that you're rested, please fill out the confidence measure again" (see Appendix E). All participants then completed the measure assessing task self-efficacy to perform the second plank again, followed by the second plank. After performing the plank a second time, participants in the descriptive norm condition filled out manipulation check measures including an assessment of message believability, understandability, persuasiveness, relevance, and group identity with the norm reference group (Appendix F). The control condition did not complete the final survey as the questions applied only to the messages received by those in the descriptive norm condition. After completing the procedures, all participants were debriefed verbally and through a written letter (see Appendix G for debriefing letter).

2.2.3 Measures

Muscular endurance time. As a measure of muscular endurance, participants were asked to perform two timed standard plank hold exercises from their feet and forearms to maximum exertion. Participants were shown a picture demonstrating the plank technique, and it was confirmed that participants had performed the exercise before. These tests followed a similar protocol to the Canadian Society for Exercise Physiology's Canadian Physical Activity, Fitness, and Lifestyle Approach Protocol for the back extension test in that participants:

1. filled out a PAR-Q form to ensure there was no bone or joint problems that could be made worse by engaging in physical activity,
2. performed a screening test to ensure there was no current discomfort or pain, and
3. held the plank position until either their technique faltered (i.e., back drops below or above horizontal) or they experienced pain or discomfort (CSEP, 2003).

In terms of the testing protocol, participants were informed that if their technique faltered, they would be given a warning and allowed to re-position once during each plank hold. A plank hold cut-off of 5 minutes maximum was implemented to ensure participant safety, as longer times might create too much stress for the lower back muscles (even among the strongest individuals). Of note, no participants reached this 5-minute cut-off point. A research assistant using a stopwatch timed the planks. Time started when the individual assumed the correct position and stopped when either the individual stopped or deviated from the correct position a second time.

Task self-efficacy. Task self-efficacy was assessed through five questions asking participants about their confidence to hold their second muscular endurance task using the five following response options - within 20% of their first plank time, within 10% of their first plank time, the same as their first plank, 10% longer than their first plank, or 20% longer than their first plank. As an example, one item asked, "How confident are you that you will be able to maintain the same plank hold time on this second attempt?" Participants answered each question on an 11-point scale ranging from 0% (not at all confident) to 100% (completely confident). Responses to the five questions were averaged and this value was used in the subsequent analyses. Reliabilities for both the pre-manipulation (α = .88) and post-manipulation (α = .88) measure of task self-efficacy were found to be good.

Norm perceptions. The current study included a one-item measure to assess participants' initial perceptions of others' behaviour. The norm perception question asked, "What do you think happened when others like you (i.e., same age range, sex, and Pilates level) performed their second timed plank hold?" Participants were asked to circle the most appropriate answer on a 7-point scale with the following options: 1. they decreased from their first plank hold time by 40%, 2. decreased by 20%, 3. decreased by 10%, 4. they held the plank for the same time, 5. they increased from their first plank hold time by 10%, 6. increased by 20%, or 7. increased by 40%". All participants answered this question after completing their first timed plank and before receiving any normative information (see Appendix D).

Group identity. To check that the reference group used in the normative messages was salient to participants, those in the descriptive norm condition received an 8-item post-manipulation survey to assess group identity (Rimal & Real, 2005; see Appendix F). Four items assessed similarity (e.g., "How similar do you think other people of the same age range, sex, and

Pilates level are to you in the way they think?") and four items assessed aspiration (e.g., "I believe the people of my age range, sex, and Pilates level are inspiring"). The items capture the two components that Rimal and Real (2005) conceptualize as comprising group identity. All questions were answered on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much so). Responses to the eight questions were averaged. Cronbach's alpha for the 8-item scale was found to be high ($\alpha = .89$).

Physical activity readiness questionnaire - PAR-Q. The PAR-Q (CSEP, 2002) was used to ensure participants did not have any health conditions that could be made worse by participating in physical activity. The questionnaire was designed by the Canadian Society for Exercise Physiology for use with anyone aged 15-69 years, and includes seven questions assessing current health and health conditions (e.g., "In the past month, have you had chest pain when you were not doing physical activity?"). Participants answered questions by checking either yes or no. They also signed and dated the bottom of the form. Only participants who answered "no" to all seven questions were permitted to participate in the study (see Appendix B for PAR-Q form).

Physical activity. The Godin Leisure-Time Exercise Questionnaire was used in the initial survey to gather demographic information about general physical activity of participants (Appendix C). This questionnaire has demonstrated acceptable reliability and validity (Godin & Shephard, 1985; Jacobs, Ainsworth, Hartman, & Leon, 1993). In agreement with the questionnaire instructions (Godin & Shephard, 1985), participants were asked about their usual weekly leisure-time physical activity in terms of strenuous, moderate, and light activities. The reported values for these three intensities were multiplied by 9, 5, and 3 respectively, and the products of each of these levels of physical activity were summed to obtain total weekly leisure activity value. This value was used to understand overall activity levels of participants as well as test for randomization.

Message quality. To ensure that the verbal messages were believable, persuasive, relevant, and easy to understand, four message quality manipulation check items were included in the post-manipulation survey completed by those in the descriptive norm condition (e.g., "The information about others' beliefs and/or activity was… believable, relevant, easy to understand, persuasive"; see Appendix F). Responses were made on a 7-point Likert scale ranging from 1

(strongly disagree) to 7 (strongly agree). These items were similar to ones used by Priebe and Spink (2012) in previous research examining normative messages for activity.

In addition to the above measures, participants answered questions about their gender, age, and Pilates experience and class/level (see Appendix C).

2.2.4 Data Analyses

Prior to the main analyses, data were screened for outliers and variables were checked for normality. ANOVA was used to test differences between conditions on potentially confounding demographic variables (e.g., age, physical activity levels, and Pilates experience).

ANCOVA, controlling for pre-manipulation muscular endurance times (covariate), was used to assess the first hypothesis that post-manipulation muscular endurance times (dependent variable) would be longer in the descriptive norm condition when compared to the control condition (factor = conditions). This technique was selected to control for any possible differences in pre-test scores for initial muscular endurance times (Tabachnick & Fidell, 2007).

ANCOVA also was used to assess the hypothesis that post-manipulation task self-efficacy (dependent variable) would be higher in the descriptive norm condition when compared to the control condition after controlling for pre-manipulation task self-efficacy (covariate).

2.3 Results

2.3.1 Descriptive Statistics

Data were screened for outliers using histograms and standardized scores and found to be satisfactory. Also, data were found to be normally distributed.

The overall mean pre-manipulation muscular endurance task was 93.0 seconds (*SD* = 41.4) and the mean time for the second attempt was 88.1 seconds (*SD* = 34.6). See Table 2.1 for dependent variables descriptive data by condition. ANOVA testing for differences between the two conditions on demographic variables (e.g., age, physical activity levels, and Pilates experience) found no between-group differences for any of the variables, *p's* > .10.

2.3.2 Manipulation Checks

Confirming that the messages created for this study would have the potential to change norm perceptions, participants' pre-manipulation perceptions of others' behaviour (i.e., descriptive norm perceptions) were found to be low. Before receiving the manipulation, most participants (75.8%) believed that others would decrease their times on the second plank attempt, 11.3% thought that others would hold their planks for the same time, and 12.9% thought

Table 2.1

Muscular Endurance Time and Task Self-Efficacy by Condition

Variable	Descriptive Norm Condition Means (SD)	Control Condition Means (SD)
Pre-Manipulation Muscular Endurance Time[a]	95.82 (42.49)	90.09 (40.67)
Post-Manipulation Muscular Endurance Time[a]	99.79 (37.22)	76.38 (27.71)
Pre-Manipulation Task Self-Efficacy[b]	44.88 (22.52)	48.29 (16.42)
Post-Manipulation Task Self-Efficacy[b]	59.71 (22.88)	48.41 (17.08)

[a]Muscular endurance on a plank hold exercise is presented in seconds as timed by stopwatch

[b]Scale: 0% *not at all confident* to 100% *completely confident*

that others would increase their plank hold by 10%. No one thought that others would increase their plank hold by 20% or more, confirming that our messages 'that similar others increased by 20%' would be greater than participants' pre-message perceptions.

Message quality manipulation checks completed by participants in the descriptive norm condition suggested that the message was easy to understand (M = 6.41, SD = .89), believable (M = 5.71, SD = 1.29), relevant (M = 5.65, SD = 1.25), and persuasive (M = 5.59, SD = 1.48; all message quality items measured on 7-point scale ranging from 1 to 7). As a comparison standard, these values are higher than the ones found in previous work examining normative messages for activity (Priebe & Spink, 2012).

Overall participants' ratings of group identity fell above the scale midpoint (M = 44.00 with the highest possible score being 56, SD = 7.40), illustrating that, on average, participants seemed to identify with the descriptive norm reference group.

2.3.3 Main Analyses

Before running the ANCOVAs, all assumptions of this analysis (i.e., normality of residuals, linearity, homogeneity of variances, homogeneity of regression slopes, and reliability of covariates) were checked and results were found to be satisfactory (Tabachnick & Fidell, 2007).

Muscular endurance time. In support of the first hypothesis that descriptive norm information would positively influence muscular endurance, results from the significant ANCOVA, controlling for pre-message muscular endurance time, F (1,65) = 17.99, $p < .001$, η_p^2 = .22 revealed that those in the descriptive norm condition (estimated marginal M = 97.95 seconds, 95% CI [91.39, 104.51]) held their second muscular endurance task for significantly longer than those in the no-information control condition (estimated marginal M = 78.23 seconds, 95% CI [71.67, 84.79]).

Task self-efficacy. In support of the hypothesis that descriptive norm information would result in higher task self-efficacy when compared to a control, ANCOVA controlling for pre-manipulation task self-efficacy scores, revealed significant differences, F (1,65) = 35.08, $p <$ .001, η_p^2 = .35. Higher post-manipulation task-efficacy scores were reported by those in the descriptive norm condition (estimated marginal M = 61.23%, 95% CI [57.82, 64.64]) when compared to the control condition (estimated marginal M = 46.89%, 95% CI [43.47, 50.30]).

2.4 Discussion

The purpose of Study 1 was to examine the influence of descriptive norm information on a muscular endurance task (i.e., plank hold) and task self-efficacy. Results supported the hypothesis that post-manipulation muscular endurance times would be higher in participants who received descriptive norm information when compared to a no-information control condition. Results also supported the hypothesis that post-manipulation task self-efficacy would be higher in those participants who received descriptive norm information.

2.4.1 Descriptive Norms and Behaviour

The finding that descriptive norm messages influenced behaviour is consistent with previous research in the activity area where perceptions about friends' behaviour was found to be related to individual's own physical activity (Priebe & Spink, 2011), and information about the behaviour of co-workers was found to influence individuals' own stair use in an office setting (Priebe & Spink, 2012). In addition, the current results extend previous research in the activity area from self-report of overall activity or activities of daily living (e.g., physical activity recall; Priebe & Spink, 2011, 2012) to an objectively-measured muscular endurance task.

Also, tying the normative messages to the individual's recent past behaviour built upon previous results by ensuring the salience of the normative messages. Salience of normative information is an important factor in Cialdini et al.'s (1990) focus theory. According to the theory, more salient normative information will have a stronger influence on behaviour. In the current study, participants were led to believe that the descriptive norms shared with them between the two muscular endurance performances were based on similar others' actual behaviour on the first plank hold exercise. In addition, the messages were relative to their performance on the first plank (e.g., "others of same gender and Pilates level increased their second plank hold by 20%"). This reduced the probability of experiencing a boomerang effect (i.e., when participants were already performing at level greater than the normative message suggested; Schultz et al., 2007), and increased the likelihood that the message was more effective than a general normative message. The use of non-individualized messages (e.g., all participants given the message that "similar others use the stairs 4 times a day") in other studies (e.g., Priebe & Spink, 2012) may offer a possible explanation why the results of that study differed from the current results.

Finally, the current study also extends previous research in the activity setting by measuring norm perceptions. While often absent in the normative literature, this step is critical in understanding if a manipulation has the potential to alter norm perceptions and subsequent behaviour (Campo et al., 2004). In the current study, mean pre-manipulation norm perceptions were found to be lower than the descriptive norm information provided in the message, suggesting that, if believable, the information in messages could potentially increase perceptions. The lack of a measurement of norm perceptions is another potential explanation for differing results reported in previous research (Priebe & Spink, 2012).

These findings add to the general norm literature and complement research in other areas where a relationship between descriptive norms and behaviour has been found (Mahler et al., 2008; Nolan et al., 2005; Polonec et al., 2006). The current findings extend previous research by examining descriptive norms in a novel way. Specifically descriptive norm messages were found to increase performance on a repeat muscular endurance task. Of interest, in response to the messages about others increasing their behaviour, those in the descriptive norm condition actually increased their performance on their second attempt (5% mean increase from their initial muscular endurance time) while those in the control decreased (18% mean decrease from initial muscular endurance times). Participants were provided with the cover story that researchers were establishing a database for muscular endurance and their two maximal efforts would be averaged. As participants were asked to give maximal effort on their first bout, it was assumed participants would be somewhat fatigued from their first maximum muscular endurance plank hold and it might be anticipated that participants in the descriptive norm condition would, at best, maintain their muscular endurance times while the control would decrease. While the possibility exists that some individuals did not give their full effort on their first attempt or recovered more quickly than others, it is hoped that these possibilities were randomly distributed between the control and descriptive norm condition. Thus, the result in the descriptive norm condition of an increase in behaviour that followed a maximal muscular endurance performance hints at the potency of the descriptive norm information and the potential effects of social influence on activity.

An alternative explanation of the current findings could be that the descriptive norm condition simply provided the individuals with a goal for their second muscular endurance task (i.e., 20% more than your first plank) while the control did not. However, this possibility could

be discounted for the following reasons. First, participants were not able to act on the 20% goal directly because they were not given any time-related or motivational feedback during or after their muscular endurance tasks. In addition, all participants were given the goal of "maximum effort" on all muscular endurance performances, which might be expected to supersede the possible challenge of "20% more". Finally, it has been found in another study that simply providing people with the 20% more information is not enough to see the change in behaviour that was observed in this study with the descriptive norm information (see injunctive condition in Study 2 of this thesis).

2.4.2 Descriptive Norms and Task Self-Efficacy

The current results also extend previous normative literature by exploring another outcome related to normative influence. Results supported the hypothesis that task self-efficacy would be higher in the descriptive norm condition. This experimental finding extends the work of Rimal et al. (2005) who found a correlation between descriptive norms and efficacy. In addition, the finding that both efficacy and behaviour were higher in the descriptive norm condition is consistent with predictions of self-efficacy theory (Bandura, 1997), and supports the possibility that descriptive norms, in conjunction with performance, might provide an efficacy-enhancing experience.

The literature contains a variety of explanations as to how descriptive norms might influence behaviour. While some suggest individuals act in accordance with group behaviours based on affiliation needs and social comparison processes (Festinger, 1954) or pressure to conform to a group (Asch, 1952), Cialdini et al. (1990) suggest that descriptive norms may serve as a decisional cue by providing information about the appropriate behaviour in a given situation. This information about what others are doing may help individuals make decisions about the appropriate action (i.e., imitate others). In the current study, the cue was the message about similar others improving by 20% on their second plank hold. Even though individuals were likely fatigued, and their initial norm perceptions indicated that they did not think others would improve by 20%, this new normative information may have factored into the greater muscular endurance time for the second attempt.

When descriptive norms relate to a simple behaviour, such as a standing ovation at a concert, it is likely that norms work by providing relevant information, as suggested by Cialdini et al. (1990). It is also possible, however, that descriptive norms influence individuals in other

indirect ways. If behaviour is challenging, for example, perhaps other variables (e.g., efficacy) account for an indirect effect of descriptive norms on behaviour. As the behaviour in the current study was a challenging task and theory posits that efficacy is effective in challenging situations (Bandura, 1997), it is possible that efficacy played a role in influencing behaviour. Results of the current study support a relationship between descriptive norms and efficacy with post-manipulation efficacy being significantly higher in those participants who received a descriptive norm message about others' behaviour. If this result can be replicated, future researchers may wish to start disentangling the effects of norms and efficacy on subsequent behaviour by testing the potential for efficacy to mediate the norms/behaviour relationship. At this stage of our research, we were simply trying to establish links between norms and efficacy, which could serve as a precursor to examining mediation in the future. Also, as messages are a cost effective way to promote activity, and there has been a call encouraging more assessment and use of messages to affect self-efficacy for physical activity (Latimer, Brawley, & Bassett, 2010), further examination of the norms/efficacy relationship appears warranted.

2.4.3 Limitations

In terms of limitations, it is possible that individual variation in effort on the muscular endurance tasks or ability to recover between the two tasks could have influenced results. While randomization between conditions and instructions to perform to maximum endurance on both tasks were hoped to control for these factors, it is not possible to rule them out. Further, it is also possible that after performing their first muscular endurance task participants may have been motivated to perform better on their second attempt, despite it being to maximum endurance. In attempt to curb this tendency, participants were instructed that their times would be averaged. In addition, this effect likely occurred in both the experimental and the control conditions. However, without a non-performance condition, it is possible that, in addition to the descriptive norm information, the first performance of the muscular endurance task might have motivated individuals' second attempt.

In addition, the use of Pilates participants limits the generalizability to this population. In a related vein, reflecting the typical profile of Pilates participants, a large majority of the sample (87%) identified as female. While gender differences have not been found in previous research examining effects of descriptive norms on activity (e.g., Priebe & Spink, 2012), there is research to suggest that females may be more influenced by norms than males (e.g., Campo et al., 2003;

Wood-Baker, Little, & Brownell, 2003). To increase the generalizabity of the current findings, further investigation with males is necessary. Also, the fact that all participants had previous experience performing the muscular endurance exercise limits the conclusions to activities where prior experience has been obtained. The exercise itself was an acute behaviour performed immediately after hearing the normative message. As such, the findings can only be extended to other situations where behaviours are performed in close succession to normative information.

2.4.4 Future Directions

The limitations of the current study provide some directions for future research. For example, the current experimental study manipulated descriptive norms to influence an acute muscular endurance behaviour. While the results are promising, future research might wish to extend these findings to more long-term or repetitive forms of physical activity. In other areas, descriptive norms have been shown to influence more long-term behaviours such as energy conservation (e.g., Nolan et al., 2008). In addition, these behaviours did not necessarily have to be performed immediately after hearing a normative message. In the activity area, research could examine the impact of descriptive norm messages on activities of daily living or regular attendance at the gym or fitness classes, as these behaviours have been consistently shown to benefit health. In addition, in line with messaging research by Latimer et al. (2010) and Brawley and Latimer (2007), it would be useful to examine the effects of multiple descriptive norm messages and other related strategies that might increase the potential of these messages to increase and maintain behaviours that might benefit health.

2.4.5 Strengths

A strength of this research was the inclusion of a measure to assess norm perceptions, which addressed a shortcoming in previous research where current perceptions were rarely measured leaving it unclear whether the normative manipulation altered individuals' perceptions about the typical behaviour (Campo et al., 2004; Rimal, 2008). In the current study, results revealed that not a single participant believed others would increase their times on their second plank attempt by 20% when assessed before the norm manipulation message. This ensured that the descriptive norm message about others increasing their behaviour by 20% on the second attempt had the potential to influence individuals' perceptions and, inter alia, behaviour.

In addition, theory was used in the conceptualization of research questions and study design (e.g., focus theory, Cialdini et al., 1990). Painter et al. (2008) advocate for greater use of

theory in the examination of behaviour change. Another strength was the use of an experimental study design including a control for past behaviour (Conner & Norman, 2005; Weinstein, 2007), and finally, the use of objective behaviour instead of self-report (Baranowski, 1988).

Results of this experimental study add to the general norm literature as well as the physical activity literature by suggesting descriptive norms might be a powerful motivator of behaviour and efficacy. In the current study, descriptive norms were found to result in participants increasing efficacy as well as performance on a second muscular endurance task. On a practical level, the finding that descriptive norms influence activity behaviour is interesting given that both researchers and media often promote descriptive norm messages about low activity levels (e.g., "Less than half of our population is active"; Cameron et al., 2007). As the current findings relate more directly to effort on a muscular endurance task, there is a need to extend these findings to physical activity in general in an effort to understand if it would be wiser to promote the reverse (i.e., a descriptive norm message highlighting that many people ARE active) if hoping to increase activity.

2.5 Bridge to Study 2

As demonstrated in Study 1, descriptive norms were related to individual activity behaviour on a muscular endurance task. While this result is interesting, it only represents one source of normative influence - an influence based on one's perception on how others behave (descriptive norm). As noted previously, there are other sources of normative influence including an influence based on perceptions of what others think should be done, termed injunctive norms (Cialdini et al., 1990). Both injunctive and descriptive norms can be found in commonly promoted activity messages (e.g., "we think you ought to be active", "the majority of North Americans are not meeting activity guidelines"). While, as demonstrated in Study 1, descriptive norms have been related to activity, injunctive norms have received no attention. This is surprising given the prevalence of "you ought to be active" messages. The first purpose of Study 2 was to examine whether injunctive norm messages will influence activity behaviour more than a no-message condition. Further, the fact that multiple norms might operate together in a given situation raises the issue of overall norm effectiveness. Given the existence of both injunctive and descriptive norms and the prevalence of mismatched messages in practice (e.g., "you should be active, but the majority are not"), the second purpose of Study 2 was to examine

the effects on behaviour when norm messages are aligned (matched injunctive/descriptive) versus misaligned (mismatched injunctive/descriptive).

CHAPTER 3
STUDY 2: EFFECTS OF INJUNCTIVE, ALIGNED, AND MISALIGNED NORM MESSAGES ON ACTIVITY

3.1 Introduction

Most Canadians know that physical activity has been linked to positive health outcomes (e.g., decreased risk of cardiovascular disease, diabetes; Cragg et al., 2007). Unfortunately, as many popular advertising campaigns convey, less than half of Canadians are active enough to achieve health benefits (Cameron et al., 2007). So why might it be that individuals are not more active, even when they know that they likely ought to be? One of the many possibilities relates to social norms.

It is possible that individuals are inactive because of the conflicting social norms they may receive. In practice, it seems that the message that "you ought to be active" is often paired with a conflicting message (e.g., "but the majority of people are not active enough"). In focus theory (Cialdini et al., 1990), the perspective that individuals ought to be active is categorized as an injunctive norm. Cialdini et al. differentiate these injunctive norms (i.e., individuals' perceptions of others' approval or disapproval of a given behavior) with another type of norm (descriptive norms). Descriptive norms reflect individuals' perceptions about the actual behaviour of others (e.g., less than half of Canadians are active at the recommended levels). So while Canadians may be receiving an injunctive norm about activity ("you ought"), they could also be receiving a mismatched descriptive norm about the same behaviour ("others don't").

3.1.1 The Pathways of Normative Influence

According to Cialdini and colleagues (1990), these two types of norms are thought to influence behaviour through conceptually different pathways. Injunctive norms are proposed to influence behaviour through the possible social sanctions of either conforming or not conforming to the norm. For example, a female may perceive that many others think she ought to not drink and drive and, if she does, she may be sanctioned in some way. Descriptive norms, on the other hand, are proposed to provide individuals with a decisional shortcut in that perceiving many others engage in a behaviour might support that this is the most appropriate course of action in that situation. For example, if a male enters a new workplace and is unsure as to the typical dress code, he may simply observe how others dress to gain information as to what is appropriate attire. Further, this normative information does not have to be seen first hand but can simply be

perceived (e.g., our example male might hear a colleague mention that most people will be wearing suits and ties to a meeting and use that information to guide his own behaviour). In light of these proposed differing pathways, Cialdini et al. (1990) argue that it is important to examine these two types of norms as separate entities.

3.1.2 Descriptive Norms and Activity

In the activity setting, there is emerging evidence to suggest that perceptions about the prevalent behaviour of others also are positively related to the self-reported activity of individuals. For example, descriptive norms about friends' physical activity have been correlated to individual activity in both university and office settings (Priebe & Spink, 2011). In an experimental study, descriptive norm messages promoting the prevalence of co-workers activity behaviours were found to increase stair use behaviour in office workers (Priebe & Spink, 2012).

In dissertation Study 1, descriptive norms were found to influence a muscular endurance activity (plank hold) in Pilates participants. Findings revealed that participants who received the descriptive norm information performed significantly better on the post –manipulation endurance performance than those in the control condition. Results also revealed that those receiving the descriptive norm message reported significantly higher task self-efficacy post-manipulation than the control.

3.1.3 Injunctive Norms and Activity

The other type of norm in focus theory, injunctive, has received little attention in the activity setting. This is surprising given that injunctive messages seem to be common in activity promotion (e.g., "we think you ought to be active"). However, there are findings outside of the activity setting to support a positive relationship between injunctive norms and conservation behaviours such as littering prevalence (Reno et al., 1993), forest conservation (Cialdini et al., 2006), and recycling (Cialdini, 2003). These empirical results support the theoretical contentions of Cialdini and colleagues (1990). Given the prevalence of injunctive norms in public service physical activity announcements, an evaluation of the influence of injunctive norms as they relate to activity seems warranted.

3.1.4 Aligned and Misaligned Norms

Given the existence of these two norm types and the possible prevalence of both types in advertising practice (e.g., "you should be active, but the majority are not" messages), there is

also a need to examine the combination of injunctive and descriptive norms. It has been suggested that when descriptive and injunctive norm information is matched (i.e., a message promoting that a behaviour is commonly done by others and also approved by others) the effects on individual behaviour will be stronger than either norm presented individually or no norm at all (Cialdini et al., 2006). Cialdini and colleagues (2006) were the first to refer to normative messages containing matched descriptive and injunctive information as having an *aligned* effect.

Research in other areas supports Cialdini and colleagues' (2006) prediction that aligned norms will influence individual behaviour. For example, in a study of conservation behaviour with hotel guests, a normative message combining injunctive and descriptive elements was found to have a stronger effect on behaviour than either injunctive or descriptive alone (Schultz et al., 2008). This effect reflecting an alignment of norm messages has been replicated with behaviours such as alcohol consumption (Lee, Geisner, Lewis, Neighbors, & Larimer, 2007), household energy conservation (Schultz et al., 2007), and pro-environmental behaviour (Smith et al., 2012). Cialdini et al. (2006) captured the essence of the aligned normative message approach by suggesting that "such a line of attack unties the power of two independent sources of normative motivation and can provide a highly successful approach to social influence" (p.13).

Despite the existing research support for communications that align descriptive and injunctive norms, in practice, it is possible that physical activity messages could be promoting a *misaligned* message in that what is promoted as "ought to be done" is "not commonly done" (e.g., a recent ParticipACTION advertisement targeted at parents stating, "60 minutes of physical activity… that's how much time kids need to spend daily on moderate to vigorous physical activity, according to Canadian Physical Activity Guidelines. Yet, 93% of Canadian children are not doing enough to meet the minimum."; ParticipACTION 2013). So while individuals might be receiving an injunctive norm exhorting activity, it is being coupled with a descriptive message stating that the behaviour is not common (i.e., only 7% do it). As the influence associated with each type of norm suggests a different direction for behaviour, the effect on individual behaviour may not be clear. Research in other areas has found that conflicting messages (i.e., misaligned) lead to weaker effects than aligned messages (e.g., Cialdini et al., 2006; Goldstein & Cialdini, 2007; Smith et al., 2012). However, to date, no studies have examined the influence of aligned versus misaligned norms on activity behaviour.

3.1.5 Purpose and Hypotheses

There were three purposes of the current study. First, this study aimed to examine the influence of injunctive norms on a specific activity behaviour (i.e., muscular endurance). Based on empirical research in other settings that has found that injunctive norm information has a stronger effect on behaviour than a no-message control condition (Cialdini et al., 2006; Reno et al., 1993), it was predicted that injunctive norm messages would influence muscular endurance behaviour more than a no-message control.

The second purpose was to examine the effects of both aligned and misaligned descriptive and injunctive norm messages on muscular endurance activity behaviour. Based on previous research in other settings (e.g., environmental conservation), it was predicted that the aligned norm message (matched descriptive and injunctive) would have a greater influence on behaviour than a message containing misaligned norms or no message (Cialdini et al., 2006; Schultz et al., 2007; Schultz et al., 2008).

A third purpose was to extend the efficacy findings of Study 1 to examine if task self-efficacy would be higher in an aligned condition when compared to injunctive alone, misaligned, and control conditions. Similar to Study 1, the current study utilized normative messages. The descriptive norm message portion of the aligned message was identical to the message utilized in Study 1. The descriptive norm element in the misaligned condition was opposite to the message in Study 1 (i.e., 80% of others did NOT hold their second plank longer) and the injunctive condition did not include a descriptive norm element. Based on the findings of Study 1, it was hypothesized that task self-efficacy for the muscular endurance activity would be higher in the aligned condition given that it was the only condition containing a successful descriptive norm component.

3.2 Method

3.2.1 Participants

Undergraduate university student participants were recruited from a midsize Canadian university. In order to control for a possible learning effect, only participants who had previous experience performing a plank were included. Eighty-six participants entered the study and were randomly assigned to one of four conditions (see below for conditions). Of those individuals, 9 were unable to complete the study as they did not give consent, answered "yes" to a PAR-Q question, did not have experience performing a plank hold exercise, or did not have satisfactory

technique on their first plank exercise. Remaining data were screened for outliers using histograms and standardized scores. After this screening, another 16 participants were deleted due to extreme values on their muscular endurance change time scores (i.e., z score > 3.29; equivalent to > 102.3 seconds away from the mean change from the first to second plank exercise). Of interest, those excluded extreme scores included both individuals who had increased as well decreased their time from the first to second plank assessment. After the above deletions, two of the conditions (aligned and misaligned) were left with higher participant numbers when compared to the other conditions. As unequal cell sizes can affect the homogeneity of variances assumption in ANOVA, deletion of cases to equalize cells as suggested by Tabachnick and Fidell (2007) for experimental designs was undertaken. Six participants in the aligned condition and 8 participants in the misaligned condition were randomly deleted leaving a final sample of 47 participants with 12 participants in the no-message control, aligned, and misaligned conditions and 11 participants in the injunctive condition.

The mean age of participants was 19.91 years (*SD* = 2.21). The majority of the participants were female (68% - female = 32, male = 15). Reflecting general activity, the mean score on the Godin Leisure-Time Exercise Questionnaire was 64.01 (*SD* = 33.29). Values on the strenuous and moderate components of this questionnaire suggest that participants had high activity levels and were most likely experiencing resulting health benefits (Godin, 2011), though it should be noted there was a fairly large spread in activity. All participants were screened for activity participation using the physical activity readiness questionnaire (PAR-Q; CSEP, 2002; Appendix B).

3.2.2 Procedures

Ethical approval for this study was attained from the University Ethics Review Board. After gaining permission from instructors, research assistants visited undergraduate classrooms to invite students to sign up to participate. Interested participants signed up for an individual 15-minute time slot to complete the study.

See Figure 3.1 for an overview of procedures. Using a random number generator, participants were randomly assigned to an injunctive norm, control, aligned, or misaligned

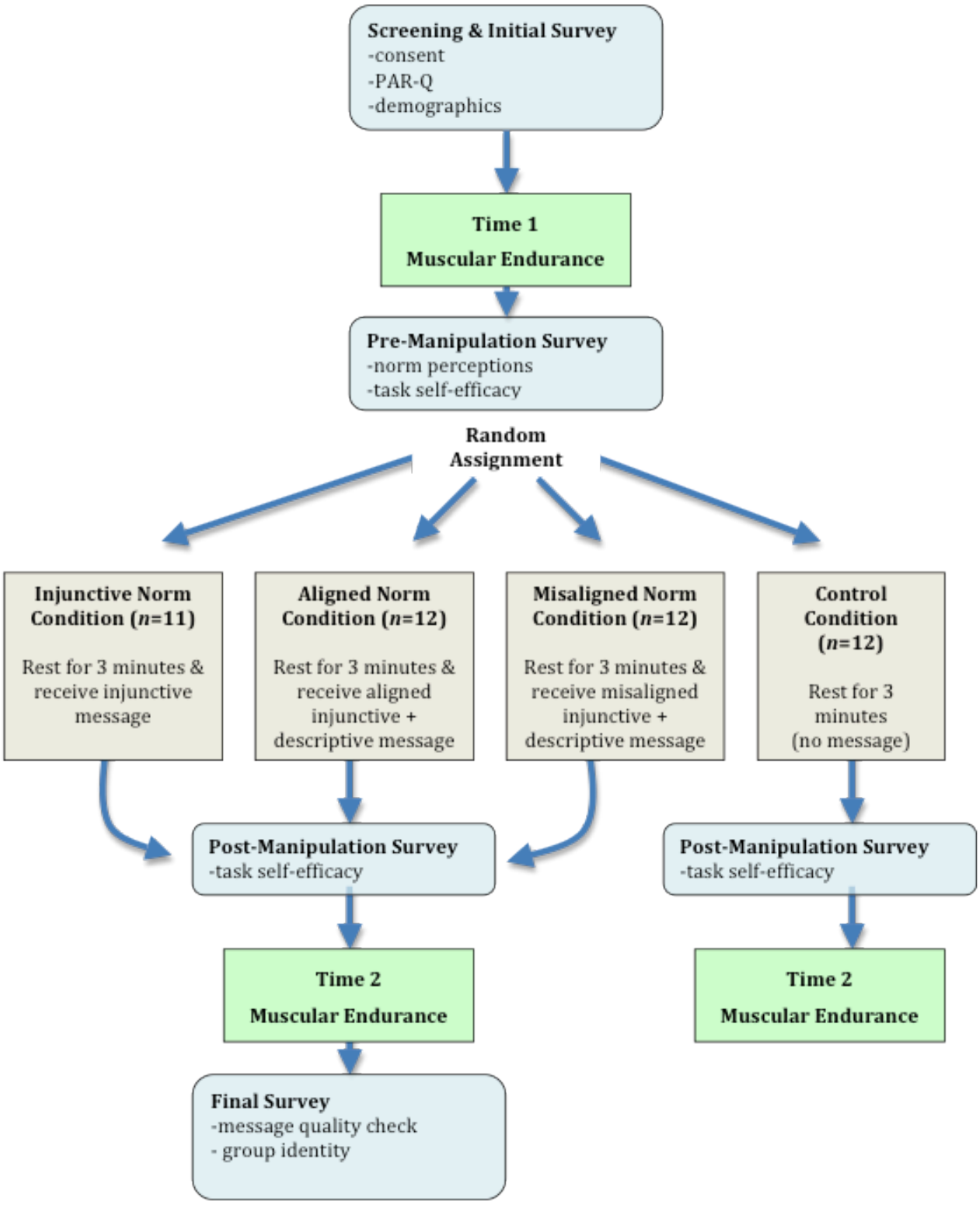

Figure 3.1 Overview of Study 2 Procedures

condition. All participants were provided with a cover story that the researchers were collecting data to create norms for a muscular endurance exercise, and that they would be asked to perform two timed maximal plank holds separated by a 3-minute rest period. Participants were told that these plank hold times would be averaged to obtain one score for each individual, and their score would be included in college norms for this physical task.

At the start of their 15-minute time slot, participants completed the consent form, the PAR-Q (Appendix B), and the initial survey assessing demographics (age, sex, college, and self-reported physical activity; see Appendix H). They were then asked to perform their first of two timed standard plank hold exercises to maximum endurance in a prone position from their feet and forearms.

Upon completion of the first plank exercise, participants immediately completed a task self-efficacy measure relating to the second plank as well as a normative perception question (Appendix I). Following this, those in the normative conditions received a verbal message specific to their condition. The experimental groups were as follows:

Injunctive. Those in the injunctive condition received a verbal message stating that "approximately 80% of similar others (i.e., same age range, sex, college) thought individuals should hold their second plank for at least 20% longer than their first".

Aligned (matched injunctive and descriptive norms). Those in the aligned condition received the same injunctive information as above but were also told that "80% of similar others (i.e., same age range, sex, and college) held their second plank for at least 20% longer than their first plank".

Misaligned (mis-matched injunctive and descriptive norms). Those in the misaligned condition received the same injunctive message that individuals thought they should be able to hold their second plank longer but were told that, "80% of similar others (i.e., same age range, sex, and college) did NOT hold their second plank for at least 20% longer than their first plank".

Control. Those in the control received no message.

With 30 seconds of rest time remaining, participants were told, "Now that you're rested, please fill out this confidence measure again" to set up the second task-efficacy measure. All participants then completed the measure assessing task self-efficacy to perform the second plank

again (see Appendix J), and then performed the second plank. After completing the task, participants in the three normative conditions filled out manipulation check measures including an assessment of message believability and group identity with the norm reference group (see Appendix K). The control condition did not complete the final survey as the questions applied only to the messages received by those in the normative conditions. After completing the questions and plank tests, all participants were debriefed verbally and in writing (see Appendix L for debriefing letter).

3.2.3 Measures

Muscular endurance time. Participants were asked to perform two timed standard plank hold exercises from their feet and forearms to maximum endurance. Participants were shown a picture demonstrating the plank technique, and it was confirmed that participants had performed the exercise before. These tests followed a similar protocol to the Canadian Society for Exercise Physiology's Canadian Physical Activity, Fitness, and Lifestyle Approach Protocol for the back extension test in that participants:

1. filled out a PAR-Q form to ensure there was no bone or joint problems that could be made worse by engaging in physical activity,
2. performed a screening test to ensure there was no current discomfort or pain, and
3. held the plank position until either their technique faltered (i.e., back drops below or above horizontal) or they experienced pain or discomfort (CSEP, 2003).

In terms of the testing protocol, participants were told that they would be given a warning if their technique faltered and allowed to re-position once during each plank hold. A plank hold cut-off of 5 minutes maximum was implemented to ensure participant safety, as longer times might create too much stress for the lower back muscles. Of note, no participants reached this 5-minute cut-off point. A research assistant using a stopwatch timed the planks. Time started when the individual assumed the correct position and stopped when either the individual stopped or deviated from the correct position a second time.

Task self-efficacy. Task self-efficacy was assessed through five questions asking participants about their confidence to hold their second plank. Response options included: within 20% of their first plank time, within 10% of their first plank time, the same as their first plank, 10% longer thank their first plank, or 20% longer than their first plank (e.g., "How confident are you that you will be able to maintain the same plank hold time on this second

attempt?"). Participants answered on an 11-point scale ranging from 0% (not at all confident) to 100% (completely confident). Responses to the five questions were averaged and this value was used in the subsequent analyses. Reliabilities for both the pre-manipulation (α = .90) and post-manipulation (α = .92) measure of task self-efficacy were found to be high.

Norm perceptions. The current study included a one-item measure to assess participants' initial perceptions of others behaviour (Appendix I). The norm perception question asked, "What do you think happened when others like you (i.e., same age range, sex, and college) performed their second timed plank hold?" Participants were asked to circle the most appropriate answer on a 7-point scale with the following options: 1. they decreased from their first plank hold time by 40%, 2. decreased by 20%, 3. decreased by 10%, 4. they held the plank for the same time, 5. they increased from their first plank hold time by 10%, 6. increased by 20%, or 7. increased by 40%". All participants answered this question after completing their first timed plank hold exercise and before receiving any normative information.

Group identity. To check that the reference group used in the normative messages was salient to participants, those in the three norm conditions received a post-manipulation survey with eight questions to assess group identity (Rimal & Real, 2005; see Appendix K). Four items assessed similarity (e.g., "How similar do you think other people of the same age range, sex, and college are to you in their values?") and four items assessed aspiration (e.g., "I look up to the people of my age range, sex, and college"). The items capture the two components that Rimal and Real (2005) conceptualize as comprising group identity. All questions were answered on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much so). Responses to the eight questions were averaged, and the average value was used in the subsequent analyses. The 8-item group identity measure was found to be highly reliable (α = .85).

Physical activity readiness questionnaire - PAR-Q. The PAR-Q (CSEP, 2002) was used to ensure participants did not have any health conditions that could be made worse by participating in physical activity (see Appendix B). The questionnaire was designed by the Canadian Society for Exercise Physiology for use with anyone aged 15-69 years, and includes seven questions assessing current health and health conditions (e.g., "In the past month, have you had chest pain when you were not doing physical activity?"). Participants answered questions by checking either yes or no. They also signed and dated the bottom of the form. Only participants who answered "no" to all seven questions were permitted to participate in the study.

Physical activity. The Godin Leisure-Time Exercise Questionnaire was used in the initial survey to gather demographic information about general physical activity participation of participants (see Appendix H). This questionnaire has demonstrated acceptable reliability and validity (Godin & Shephard, 1985; Jacobs et al., 1993). In agreement with the questionnaire instructions (Godin & Shephard, 1985), participants were asked about their usual weekly leisure-time physical activity in terms of strenuous, moderate, and light activities. The reported values for these three intensities were multiplied by 9, 5, and 3 respectively, and the products of each of these levels of physical activity were summed to obtain total weekly leisure activity score.

Message quality. To ensure that the messages were believable, persuasive, relevant, and easy to understand, four message quality manipulation check items were included in the post-manipulation survey completed by those in the normative conditions (e.g., "The information about others' beliefs and/or activity was… believable, relevant, easy to understand, persuasive"; see Appendix K). Responses were made on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

In addition to the above measures, participants answered questions regarding their age, sex, and college (see Appendix H for initial survey).

3.2.4 Data Analyses

Prior to the main analyses, data were screened for outliers and variables were checked for normality. ANOVA was used to test differences between the four conditions on demographic variables and potential confounding variables (e.g., age, physical activity levels). Another ANOVA, comparing the three norm conditions, tested for possible differences between message manipulation checks (e.g., believability) and group identity.

ANCOVA was selected to test the main hypotheses in this study as it allowed for a control of any possible differences in pre-test scores in the dependent variables (Tabachnick & Fidell, 2007). ANCOVA, controlling for pre-manipulation muscular endurance times, was used to test for differences in post-manipulation muscular endurance times (dependent variable) between conditions (independent variable). Post-hoc analyses assessed the hypothesis that post-manipulation muscular endurance times would be longer in the injunctive condition versus the no-message control condition and examined the hypothesis regarding differences between the aligned and misaligned norm messages.

Finally, ANCOVA also was used to assess the hypothesis that post-manipulation task self-efficacy (dependent variable) would be higher in the aligned norm condition when compared to the other conditions, after controlling for pre-manipulation task self-efficacy.

3.3 Results

3.3.1 Descriptive Statistics

Data for final sample (N = 47) were found to be normally distributed. The overall mean pre-manipulation muscular endurance time was 132.47 seconds (*SD* = 57.29) and the mean muscular endurance time for the second attempt was 114.00 seconds (*SD* = 52.21). See Table 3.1 for descriptive data by condition.

3.3.2 Randomization and Manipulation Checks

Results from an ANOVA testing for differences between the four conditions on demographic variables (e.g., age, physical activity levels) revealed no differences between conditions for any of the variables, *p*'s > .10. Message quality manipulation checks completed by participants in the three norm conditions suggested that the messages were easy to understand (*M* = 6.00, *SD* = 1.24), believable (*M* = 5.04, *SD* = 1.42), relevant (*M* = 4.94, *SD* = 1.35), fairly motivating (*M* = 4.40, *SD* = 1.79) and persuasive (*M* = 4.79, *SD* = 1.41; all message quality items measured on 7-point scale ranging from 1 to 7). As a comparison, these values are similar to ones seen in previous work examining normative messages for activity (Priebe & Spink, 2012). In addition, there were no significant differences between conditions, *p*'s > .10.

Confirming that the messages created for this study would have the potential to change norm perceptions, participants' pre-manipulation perception of others' behaviour was found to be low. Most participants (73%) believed that others would decrease their times on the second plank attempt, 20% thought that others would hold their planks for the same time, and 7% thought that others would increase their plank hold by 10%. Similar to Study 1, not a single participant reported that others would increase their plank hold by 20% or more, confirming that the descriptive norm in our messages 'that similar others increased by 20%' would be greater than their pre-message perceptions.

Finally, participants in the norm conditions reported moderately high group identity (*M* = 39.20 with the highest possible score being 56, *SD* = 6.80), suggesting that identity levels were sufficient for norms to influence behaviour in the three normative conditions. As a reference for comparison, this value is slightly less than what was seen in Study 1 but higher (relative to the

Table 3.1

Muscular Endurance Time and Task Self-Efficacy by Condition

Variable	Control Means (SD)	Injunctive Norm Means (SD)	Aligned Norm Means (SD)	Misaligned Norm Means (SD)
Pre-Manipulation Muscular Endurance Time[a]	129.50 (53.47)	137.00 (40.66)	105.92 (58.96)	157.83 (66.21)
Post-Manipulation Muscular Endurance Time[a]	105.58 (44.50)	106.09 (31.11)	105.33 (61.35)	138.33 (62.51)
Pre-Manipulation Task Self-Efficacy[b]	51.50 (17.89)	39.36 (15.51)	59.17 (12.58)	42.17 (15.80)
Post-Manipulation Task Self-Efficacy[b]	55.67 (17.66)	46.18 (18.10)	72.42 (12.59)	49.00 (17.28)

[a]Muscular endurance on the plank hold exercise was measured as time in seconds as timed by stopwatch

[b]Scale: 0% *not at all confident* to 100% *completely confident*

scale) than values found in previous norm research measuring similar constructs (e.g., Neighbors et al., 2010; Rimal et al., 2005). No differences in group identity emerged between norm conditions, $p > .10$.

3.3.3 Main Analyses

Before running the ANCOVAs, all assumptions (i.e., normality of residuals, linearity, homogeneity of variances, homogeneity of regression slopes, and reliability of covariates; Tabachnik & Fidell, 2007) were checked. Normality was confirmed and assumptions were met.

Results from the ANCOVA examining differences in post-manipulation muscular endurance times after controlling for pre-manipulation muscular endurance times revealed differences between conditions, $F(3,42) = 9.42$, $p < .001$, $\eta_p^2 = .40$. In support of one of the main hypotheses, post-hoc analyses controlling for pre-manipulation muscular endurance times, revealed that the aligned norm condition (estimated marginal $M = 129.24$ seconds, 95% CI [121.54, 136.93]) held their muscular endurance task for significantly longer than those in the misaligned (estimated marginal $M = 115.50$ seconds, 95% CI [107.83, 123.17]), $p = .017$. Of interest, means for second muscular endurance times in the aligned condition also were significantly higher (p's $< .001$) than the control condition (estimated marginal $M = 108.26$ seconds, 95% CI [100.79,115.72]) and injunctive condition (estimated marginal $M = 102.01$ seconds, 95% CI [94.21, 109.81]). Results pertaining to the other hypothesis of the study revealed that the injunctive condition did not differ from the control in post-manipulation muscular endurance times after controlling for pre-manipulation times, $p > .10$.

In support of the hypothesis that aligned norm information would result in higher task self-efficacy compared to the other conditions, ANCOVA controlling for pre-manipulation task self-efficacy revealed differences between conditions, $F(3, 42) = 4.11$, $p = .012$, $\eta_p^2 = .28$. Post-hoc analysis revealed significantly higher post-manipulation task-efficacy reported by the aligned norm condition (estimated marginal $M = 61.73\%$, 95% CI [57.68, 65.77]) when compared to the control condition (estimated marginal $M = 52.47\%$, 95% CI [48.66, 56.29]), injunctive condition (estimated marginal $M = 54.86\%$, 95% CI [50.74, 58.98]), and misaligned condition (estimated marginal $M = 54.93\%$, 95% CI [51.06, 58.80]), p's $< .05$.

3.4 Discussion

The main purpose of this study was to examine the effects of injunctive, aligned (matched injunctive and descriptive), and misaligned (mismatched injunctive and descriptive)

norms on muscular endurance behaviour. Results supported the main hypothesis that an aligned norm message would have a greater influence on muscular endurance behaviour than a misaligned norm message. This finding is consistent with findings in other areas where aligned normative messages containing both descriptive and injunctive information seem to have the greatest effects on behaviour or intentions when compared to misaligned norms (e.g., Cialdini et al., 2006; Gockeritz, Schultz, Rendo, Goldstein, & Griskevicius, 2010; Lee et al., 2007; Schultz et al., 2008; Smith et al., 2012).

3.4.1 Aligned and Misaligned Norms and Activity

This is the first study to investigate the effects of combining (either aligned or misaligned) descriptive and injunctive norms on muscular endurance activity. The finding that a misaligned norm (containing a mismatched descriptive norm) was less effective than an aligned norm is interesting and, if replicated, may have potential practical significance as these norms sometimes appear as part of public service messages (e.g., messages promoting the need to be active juxtaposed with messages that "the majority of Canadians are inactive"). Consistent with the finding of Cialdini and colleagues (2006) in the area of forest conservation, findings of the current study seem to suggest that a descriptive norm message about the prevalence of an unintended behaviour (i.e., indicating that a lot of people did not perform as well in the activity) combined with an injunctive might result in the poorer performance when compared to aligned messages.

3.4.2 Injunctive Norms and Activity

In terms of examining injunctive norms separately, results revealed that the injunctive norm condition did not differ from a no-message control condition. While this result differs from empirical findings with other behaviours such as littering and recycling (e.g., Cialdini, 2003; Reno et al., 1993), theory might provide a possible explanation as to why the results in this activity study were different.

Focus theory (Cialdini et al., 1990) predicts that injunctive norms operate through assumed social sanctions if one does not conform to the behaviour. While most would agree that one "ought" to be active, it seems less likely that one feels a meaningful amount of approval or disapproval from others regarding activity level. For example, it would be the exception to receive disapproving looks if taking an escalator instead of using the stairs in an airport. Contrast this with littering behaviour where the social sanctions regarding littering and the

amount of disapproval individuals feel if they do litter are likely more salient at this time than the social sanctions and disapproval one experiences for being inactive. Thus, it is possible that injunctive norms are less effective in the activity area when compared to behaviours such as littering and environmental conservation where a relationship between injunctive norms and behaviour does emerge. Of note, however, this suggestion is based on the results from a single study of a muscular endurance activity, and much more research is needed to truly understand the effects of injunctive norms on physical activity. For example, there may be situations where social sanctions for complying with activity norms may be stronger than in the current study (e.g., on sports teams or within other active subgroups, companies promoting activity from top-down). As an illustration, within a regular spin exercise class, attendees might develop injunctive norms regarding attendance and work ethic during class, which might involve group sanctions (e.g., exclusion) if members do not conform. The examining of injunctive norms for activity in these situations requires further investigation.

There also is a second possible explanation for the current results that involves self-regulatory capacities. In a recent study (Jacobson, Mortensen, & Cialdini, 2011), it was argued and found, that injunctive norm messages requesting an individual to perform an additional task were found to be less effective, and descriptive norm messages more effective, when delivered after self-regulatory capacities were proposed to be depleted (i.e., following a 90-minute lecture). As it could be argued that self-regulatory capacities would have been depleted after performing the first maximal muscular endurance task, the superiority of the descriptive/aligned over the injunctive may reflect the timing of the message delivery versus the normative emphasis. This requires future research.

3.4.3 Aligned Norms and Efficacy

A third purpose of the current study was to extend the efficacy findings of Study 1 to examine if task self-efficacy would be higher in an aligned condition when compared to injunctive alone, misaligned, and control conditions. In support of the hypothesis, task-self-efficacy was higher in the aligned condition, the only condition to contain a positive descriptive norm component, when compared to all other conditions. This finding is consistent with the findings of Study 1 and provides further insight into the norms-efficacy relationship. In this study, efficacy to perform the second muscular endurance task did not seem to be affected by the injunctive or misaligned messages, but rather was only influenced by the one message that

contained a descriptive norm component about the majority of others being successful at the activity. Perhaps hearing about similar others having success at an activity encourages the, "If they can do it, maybe I can do it" attitude. This suggestion is consistent with the one made in Study 1, that descriptive norms possibly provide a vicarious experience and therefore inform efficacy beliefs (Bandura, 1997). While more research is needed, this study is suggestive of a possible indirect pathway through which norms might influence muscular endurance activity.

3.4.4 Limitations

While these results extend the literature in a number of ways, there are some limitations. One important consideration concerns the conclusions that can be drawn in regard to the aligned condition. Specifically, the results revealed that the aligned normative information was the most effective influence on muscular endurance task performance. What is unknown, however, is why the aligned condition was effective. Was it effective because of the aligned component (i.e., the combination of both a descriptive and an injunctive norm together)? Or was it effective simply because of the inclusion of a descriptive norm? We know from past research (e.g., Priebe & Spink, 2011, 2012) and Study 1 results that descriptive norms are related to activity. Injunctive norms, on the other hand, were not influential with respect to task performance in the current study. Thus, it is possible that the descriptive norm was the active element in the aligned message in the current study, but this cannot be claimed with any certainty without comparing the aligned condition to a descriptive-only condition. As the research questions of the current study did not relate to descriptive norms alone and previous research has already examined the effects of descriptive norms on activity behaviour (e.g., Priebe & Spink, 2011, 2012; Study 1), a descriptive norm condition was not included in the current study. However, as the present design precludes determining whether it was the combination of norms or simply the presence of descriptive norms that accounted for the effect of the aligned message, the addition of an independent descriptive norm condition would be an important direction for future research.

Similar to Study 1, another limitation of this study was the possibility that individual variation in effort on the muscular endurance tasks, ability to recover between the two tasks, and motivation to perform better on the second task regardless of the manipulation could have influenced results. While randomization between conditions and instructions that times would be averaged and participants would perform to maximum were hoped to control for these factors, it is still possible that they played a role in influencing behaviour.

Like many studies, caution must be exercised in generalizing the results. The results of this study are limited to a fairly active sample of young adult university students performing a static muscular endurance task. Focus theory (Cialdini et al., 1990) predicts that norms, whether descriptive or injunctive, will be most effective in situations in which they are focal (i.e., salient). As physical activity in general, and especially a more demanding activity such as a maximum-endurance plank hold, might vary in salience for other populations, future research could continue to examine the effects of activity norms in other population with special attention given to focal activity behaviours for that population.

3.4.5 Strengths

Despite these limitations, this research had a number of strengths. First, the results contributed to the literature on norms. This study extended the examination of the combined (aligned and misaligned) effects of norms, as well as the individual influence of injunctive norms, to a new area – physical performance. In addition, this research differentiated between descriptive and injunctive norms. As noted by both Cialdini and colleagues (1990) and Rimal (2008), researchers in the normative area often fail to differentiate between types of norms and instead collapse them into one "norm" variable. As injunctive and descriptive norms can have differing effects on behaviour (Cialdini et al., 1990; Reno et al., 1993), important relationships may go undetected when these norms are not examined as separate entities. However, it also is important to examine the interplay between these two types of norms (Smith et al., 2012), which is why the investigation of the aligned and misaligned norms for activity was an important research step.

Another strength of the current study is that, consistent with Study 1, norm information used in the manipulation was relative to participants' previous performance. This negated the potential for a "boomerang effect" (i.e., when individuals already performing at a level above the delivered descriptive norm decrease their behaviour to comply with the norm; Schultz et al., 2007). In their study on environment conservation, Schultz and colleagues (2007) added smiley faces (a crude form of an injunctive norm) to normative feedback for those individuals already performing at a level above a positive descriptive norm. In this study, however, I took it one step further by ensuring that the normative information received by all participants was a relative percent improvement from their first to their second muscular endurance task.

Finally, consistent with Study 1, the dependent variable in this study was an objective behaviour (as opposed to self-report), the study included a control for past behaviour (Baranowski, 1988), and norm perceptions were measured as a check that messages had the potential to change behaviour. The benefits of assessing an objective behaviour, controlling for past behaviour, and assessing norm perceptions are discussed in more detail in Study 1 of this thesis.

3.4.6 Future Directions

In terms of future directions, some research suggests that injunctive norms might moderate the relationship between descriptive norms and behaviour in that a descriptive norm will have a greater effect on behaviour if it is perceived as involving approval (e.g., Gockeritz et al., 2010; Rimal & Real, 2005). In contrast, others suggest the opposite with descriptive norms moderating the injunctive norm-behaviour relationship (i.e., if an individual thinks a behaviour is approved, he/she will be more influenced by that injunctive norm if he/she also perceives many others as engaging in that behaviour; Smith et al., 2012). Further, it has been suggested that injunctive norms might be implicit in a descriptive norm in that if one perceives everyone else is doing something, it might be assumed to be socially approved (i.e., what "ought" to be done; Rimal & Real, 2005). This latter perspective might be the most consistent with the current research and previous findings in the activity area thus far, but further research is necessary. While the goal of the current research was not to investigate these other possibilities, they may be important areas of future investigation, especially when aligned and misaligned norms are involved.

There are other avenues for further research when it comes to the interplay between injunctive and descriptive norms. For example, in this study the misaligned message included an injunctive norm promoting a specific behaviour coupled with a descriptive norm suggesting that the behaviour was not attained by most similar others. However, it would be interesting to examine the misaligned norm message from the reverse perspective (e.g., "to save time, most people do not think you should take the stairs, but most people do") to see if it would produce different results.

As the results of the current study only apply to a single instance of physical performance, an interesting future direction would be to examine the effects of aligned norms on more long-term activity behaviour. Specifically, it would be interesting to see if the aligned

normative informative would relate to the maintenance of the lifestyle behaviour of being active on a daily basis. As multiple messages are suggested as necessary to improve adherence over time (Latimer et al., 2010), examining the use of multiple aligned norm messages, along with other possible strategies to improve message effectiveness (e.g., Brawley & Latimer, 2007) on more long-term activity behaviour would be a related future direction.

In addition, one explanation for the finding that the injunctive condition in this study did not differ from control is that injunctive norm messages might not be enough to impact change in activity. Perhaps an injunctive norm message on its own is not enough to impact behaviour as individuals may not feel any meaningful social sanctions associated with not engaging in the activity. Regardless of the explanation, the findings of the current study suggest that a possible way to increase the effectiveness of an injunctive norm is by pairing it with a descriptive norm. In terms of practical conclusions from the current study, those wishing to encourage muscular endurance activities using norms might consider focusing on promoting aligned normative messages as opposed to misaligned or injunctive alone. In conclusion, the results of this study, when added to those from the first study, suggest the effect that specific types of norms about others' thoughts and behaviours can have on a muscular endurance task.

3.5 Bridge to Study 3

As noted in both Studies 1 and Study 2, there is a need to extend the examination of norms on activity to more lifestyle activities. Study 3 examined the usefulness of norms to increase light physical activity and decrease sedentary behaviour in a "real world" office setting. Study 3 focused on descriptive norms as these seemed to have the most empirical support in the activity area (e.g., Priebe & Spink, 2011, 2012; Studies 1 and 2). As a further extension of past research, Study 3 also explored a possible reason for previous conflicting results (e.g., Priebe & Spink, 2012) by examining the importance of norm reference group salience.

CHAPTER 4
STUDY 3: USING DESCRIPTIVE NORM MESSAGES TO INCREASE LIGHT ACTIVITY AND DECREASE SEDENTARY BEHAVIOUR IN THE OFFICE

4.1 Introduction

As noted in the previous two studies, there is both correlational (Priebe & Spink, 2011) and experimental research (e.g., Priebe & Spink, 2012) supporting a relationship between descriptive norms and activity behaviour. Study 1 of this thesis extended previous research by experimentally examining the relationship between descriptive norms and objective activity behaviour. Descriptive norms were found to result in an increase in physical performance when compared to a control condition, after controlling for baseline performance. In Study 2, an experimental design was used to examine the effects of different normative conditions (aligned descriptive and injunctive, misaligned descriptive and injunctive, injunctive, and control) on physical performance. The most effective condition was the one containing a positive descriptive norm element. This further emphasizes the potential impact of this specific type of norm on activity.

4.1.1 Characteristics of the Norm Reference Group

While the previous results are promising, some important questions still remain unanswered. One area that was not investigated in the first two studies, but deserves attention, relates to an examination of the characteristics of the norm reference group. Examining these characteristics might help to explain conflicting results in past studies. For instance, the correlation between descriptive norms and activity found in a previous study (Priebe & Spink, 2011) was only present when the reference group was framed as friends. Similar findings regarding reference group differences emerge in other areas. For example, Polonec and colleagues (2006) found a stronger relationship between the drinking behavior of college students and the norms of friends than with the norms of others in the students' college. Similarly, Campo et al. (2003) found that norms about a "typical student" were not related to behavior in students, while norms about "friends" were related. These findings prompt the question of, "What is it about certain groups (e.g., friends) that might encourage stronger normative influence?"

As norms involve interpersonal relationships (Cialdini et al., 1990), it is possible that descriptive norms are only effective when they refer to groups where the individual feels some

type of similarity. This is consistent with focus theory, which highlights salience (possibly captured by similarity) as an important element of normative influence (Cialdini et al., 1990). Using physical activity as an example, it is possible that norms about the activity of a group to which one feels similar would have a stronger effect than descriptive norms about society in general (e.g., public service announcements conveying others are active). This suggestion is consistent with the views of the social identity approach advocated by Terry and Hogg (1996), which suggest that the norms of a group should influence individuals when the individual strongly identifies with that reference group.

In addition to having a conceptual underpinning, empirical support exists for the emergence of a stronger relationship between descriptive norms and behaviour in those who highly identify with their reference group. Most of this research comes from non-activity areas (e.g., drinking behaviour, Rimal & Real, 2005; sorting tasks, Jetten, Spears & Manstead, 1997; business role-play, McAuliffe, Jetten, Hornsey, & Hogg, 2003; sun-protections, Terry & Hogg, 1996). However, emerging cross-sectional evidence exists in the areas of physical activity (e.g., Rimal et al., 2005) and sport (e.g., Robinson et al., 2011) demonstrating the emergence of stronger relationships between norms and behaviours when group identity is high.

4.1.2 Personal and Contextual Similarity

In addition to research supporting the effects of salience in the form of group identity on the descriptive norms/behaviour relationship, it also has been suggested that salience to a norm reference group could be further qualified. Goldstein et al. (2008) argue that normative research has focused on the personal similarity of reference groups (i.e., how similar they are in values, morals, characteristics), but suggest that contextual similarity in terms of proximity and situation (e.g., working in the same building versus in another city) also might be important. As one example of a contextual difference, Goldstein and colleagues (2008) found that normative messages about hotel towel re-use were most effective when describing group behaviour that occurred in the setting most closely aligned with the individuals' immediate context (e.g., "the majority of guests who also stayed in this room reused their towels") when compared to normative messages about more distal groups (e.g., "other guests", "fellow citizens"). Based on the suggestions of Goldstein et al. (2008), descriptive norms that differ in both personal and contextual similarity will be examined for their effects on activity in this study.

4.1.3 Sedentary Behaviour in the Office

Further, a useful extension of previous research would be to examine descriptive norms in relation to an emerging lifestyle behaviour associated with health - sedentary behaviour. In addition to benefiting from increased physical activity, many people also could benefit from decreasing their sedentary time (Marshall & Ramirez, 2011). Sedentary behaviour carries health risks independent of insufficient physical activity (Biddle, Gorely, Marshall, Murdey, & Cameron, 2004; Pate, O'Neill, & Lobelo, 2008). While there is still ambiguity regarding a definition, sedentary behaviour seems to be most commonly defined as a "distinct class of behaviours that involve sitting and low levels of energy expenditure, typically less than 1.5 metabolic equivalents (METs)." (Marshall & Ramirez, 2011, p. 519). As most studies do not measure METs, and there are very few seated activities that are above 1.5 METs, Marshall and Ramirez (2011) suggest that sedentary behaviour is best operationalized as sitting.

Examining sedentary behaviour is important for two reasons. First, it has been known for some time that prolonged sitting has been associated with negative health consequences. For example, in the 1950s, London bus drivers were found to have higher rates of cardiovascular events than employees who stood and walked while working (e.g., ticket collectors; Morris, Heady, Raffle, Roberts, & Parks, 1953). More recently, Gilson and colleagues (2009) found that office workers who did not take breaks had less favourable cardio-metabolic risk profiles than workers who took short 2-3 minute breaks from sitting, even after controlling for moderate to vigorous physical activity. In addition, sedentary behaviour in adults has been associated with obesity (Must & Tybor, 2005), hypertension (Beunza et al., 2007), increased risk of cardiovascular disease (Thorp et al., 2010), metabolic syndrome (Sisson et al., 2009), type 2 diabetes (Hu, Li, Colditz, Willet, & Manson, 2003), and a variety of cancers (e.g., colon cancer, Garabrant, Peters, Mack, & Bernstein, 1984; endometrial cancer, Moore, Gierach, Schatzkin, & Matthews, 2010; ovarian cancer, Patel, Rodriguez, Pavluck, Thun, & Calle, 2006). Of note, associations with health have been found independent of overall physical activity, further emphasizing the need to consider sedentary behaviour as its own entity.

Second, the typical adult in the Canada is estimated to spend about 9.5 hours of their waking hours being sedentary (Colley et al., 2011). Further, it is speculated that adults in office jobs involving a great deal of "desk time" are likely sedentary for more time than this average compared to those in occupations such as the trades, which are likely sedentary less (Hu et al.,

2003). As such, both the World Health Organization (2008) and researchers (e.g., Chau et al., 2010; Marshall & Remirez, 2011) acknowledge the need for more research examining ways to decrease sedentary behaviour in office settings. In 2010, Chau and colleagues conducted a systematic review of the effectiveness of workplace interventions to reduce sitting. Of the six studies that met their inclusion criteria, no study showed a significant decrease in sitting in an intervention group when compared to a control group (Chau et al., 2010). They concluded that evidence on the effectiveness of workplace interventions for reducing sitting is a gap in the scientific literature that needs to be addressed. In reviews of the area, both Chau and colleagues (2010) and Marshall and Ramirez (2011) suggest that one practical way to reduce sedentary behaviour is to break up sitting time, possibly by increasing light intensity activities, which have been shown to be negatively correlated to sedentary time (Healy et al., 2008). Breaking up total sitting time might relate to health benefits (Levine, Eberhardt, & Jensen, 1999). For example, researchers have identified important health-related outcomes (e.g., improved metabolic profile) when individuals move from sitting to standing (Hamilton, Hamilton, & Zderic, 2004).

As descriptive norms have shown some promise in the area of increasing self-reported physical activity in office workers (e.g., Priebe & Spink, 2012), it also might be important to extend research utilizing descriptive norms to increase light activity that might break up sedentary time. In addition, as descriptive norms often are examined in relation to decreasing the prevalence of other negative behaviour (e.g., less alcohol consumption, Rimal & Real, 2005; less littering, Cialdini et al., 1990), it seems promising to apply the concept to the possibility of decreasing sedentary behaviour (i.e., less sitting time).

4.1.4 Purpose

The purpose of this study was to examine the effect of personally and contextually salient descriptive norm information delivered via email on sedentary behaviour and light activity (to break up sedentary behaviour) in an office worker population. This study was a field experiment using a 2 (time) x 2 (contextual similarity) x 2 (personal similarity) design. Office workers were assigned to one of four conditions (high personal/high contextual; high personal/low contextual; low personal/high contextual; low personal/low contextual) and received descriptive norm messages, specific to their condition.

4.1.5 Hypotheses

Several hypotheses were advanced that addressed the influence of the characteristics of descriptive norm messages on the behaviour of office workers. All of the hypotheses were proposed as specific, directional differences concerning main effects:

1. In terms of time, it was hypothesized that the descriptive norm messages about others' activity and sedentary behaviour in the office would result in an increase in light activity and decrease in sedentary behaviour.
2. In terms of contextual similarity, it was hypothesized that descriptive norms about more contextually similar reference groups would decrease sedentary behaviour and increase light activity more than those about less contextually similar reference groups.
3. For personal similarity, descriptive norm messages about more personally similar reference groups would decrease sedentary and increase light activity more than those about less personally similar reference groups.

As this was the first study in the activity area to examine the effects of contextual and personal similarity together, and the theory does not predict which similarity type will necessarily be more effective, no hypothesis about differences between these two types of reference-group similarities was made (i.e., no interaction effects were hypothesized).

The use of the email to deliver the messages was deemed to be a potentially useful avenue to promote activities that break up sitting time. Researchers have begun to investigate the usefulness of the internet as a tool to promote physical activity behaviours (e.g., Carr et al., 2013). Further, research is emerging to support use of web-based manipulations to reduce sedentary behaviour (Irvine et al., 2011). These might be especially effective in work place settings where existing communication networks are often in place, which potentially could be used to promote behaviour change (Dishman, Dejoy, Wilson, & Vandenberg, 2009).

4.2 Method

4.2.1 Participants

Participants for this study (N = 142) were office workers employed in the head office of one large private company. In terms of final numbers for the analyses, 38 individuals did not complete all surveys and 8 participants did not recall receiving the manipulation messages, leaving 96 participants (see Figure 4.1 for flow of participants through the experiment). Mean

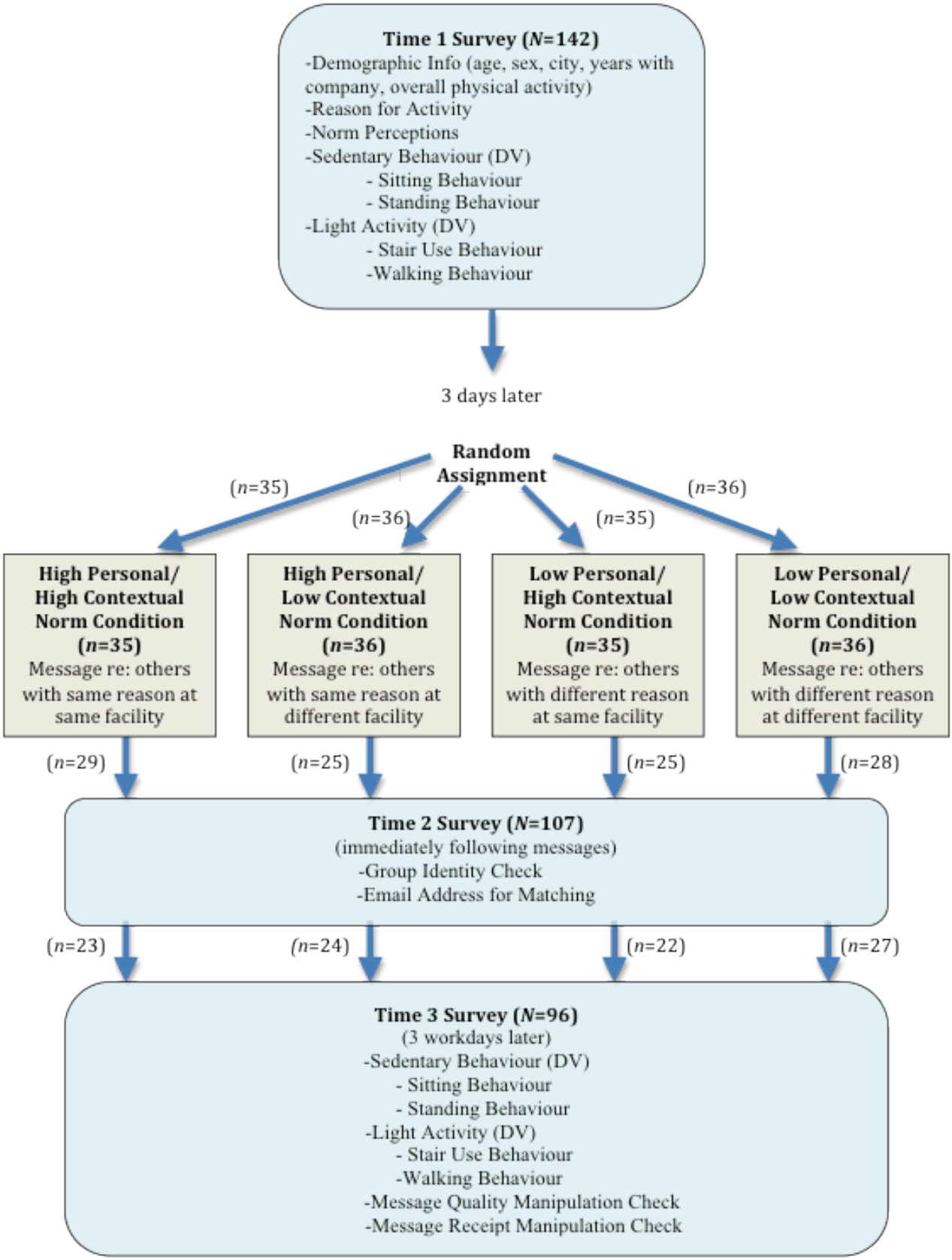

Figure 4.1 Overview of Study 3 Procedures

age of the final sample was 40.30 years (*SD* = 12.02 years) with 66% being female and 34% being male. Time with company ranged from a few months to 35 years with a mean of 10.76 years (SD = 10.68 years). In terms of overall physical activity, mean reported total weekly leisure activity level as measured by the Godin Leisure Time Exercise Questionnaire was 43.51 (*SD* = 24.66). This value suggests that participants were moderately active and quite possibly experiencing some health benefits as a result (Godin, 2011).

4.2.2 Procedures

Ethics approval was obtained for this study from the University Ethics Review Board. Researchers met with representatives of the company to request permission to conduct the study using its employees. Once permission was received, participants were recruited through an email sent by human resource personnel on the researchers' behalf to potential participants. Participants who chose to participate followed a link to the consent form (see Appendix M), and completed a series of online surveys on their own time.

This study involved three online surveys (spaced over 10 days), each taking 5-10 minutes to complete (see Figure 4.1). Of note, the dependent variables were assessed in surveys one and three. Participants filled out the first online survey, which measured demographics, self-reported activity, motivation for being active, walking and stair use behaviour, sedentary behaviour (percent sitting time, longest total sitting time, standing), and initial descriptive norm perceptions (see Appendix N). Three to four days after completing the first survey, participants were randomly assigned to one of four conditions: high personal/high contextual (n = 23), high personal/low contextual (n = 24), low personal/high contextual (n = 22), low personal/low contextual (n = 27; participant numbers shown here reflect final numbers after attrition from survey one to three). Following assignment, participants received an email that contained norm-based information (specific to their condition) outlining how fellow workers were being active at the office.

This email was designed to appear as a follow up to the results from the first survey that participants had completed. In all cases, regardless of participants' actual initial survey values, messages highlighted that a norm reference group of other employees were standing up from their desk, using the stairs, and walking around the office more than they were in a typical day (i.e., a descriptive norm for higher light activity and lower sedentary behaviour). In terms of the manipulation, the contextual similarity component was varied by the location of the norm

reference group. Specifically, those in the high contextually similar conditions received a message about "employees at YOUR [company name] head office" while those in the low contextually similar conditions received a message about "employees at [company name] offices in OTHER PROVINCES". Personally similarity was manipulated as reason for being active. Those in the high personally similar conditions received a message about employees who "are active for the SAME MOTIVATIONAL REASON (health vs. non-health) that you identified in the survey" while those in the low personally similar conditions received a message about other employees who "are active for A DIFFERENT MOTIVATIONAL REASON (health vs. non-health) than you identified in the survey". See Appendix O for full condition-specific messages.

A link was placed at the end of this email message that took participants to a second online survey that assessed participants' identity with the group referred to in the messages (see Appendix P). The third survey was sent three work days after the email message/second survey and assessed self-reported (a) light activity in the office (stair use, walking on breaks), and (b) sedentary behaviour (measured by sitting and standing), and manipulation checks (see Appendix Q). Participants completed all surveys independently using a computer at a location of their choice. After completing the final survey, participants received an online debriefing letter (see Appendix R).

4.2.3 Measures

Sedentary behaviour

As there is no consensus on a "gold standard" measure of sedentary behaviour, one was developed specifically for this study using recommendations gleaned from previous reviews of sedentary behaviour research. In their review of the area, Marshall and Ramirez (2011) argue that sedentary behaviour is best operationalized as sitting, and should focus on domain-specific sitting time (i.e., in the workplace) or the breaking up of sitting time (Marshall & Ramirez, 2011), which resulted in the creation of the following two measures.

Longest period of sitting time. Length of sitting periods has been identified as an important consideration when it comes to sedentary behaviour (Marshall & Ramirez, 2011). To measure the longest period of sitting during their workday, participants were asked to think about a typical day at the office in the last week (Time 1 survey) or last three days (i.e., since receiving the email; Time 3 survey) and record the longest period of continuous sitting that they did at one time during the morning (i.e., the time between 9am – noon) as well as the afternoon (between

1pm – 5pm) of that day. The day was broken up into these two time periods in attempt to aid in accurate recall by participants as well as focus exclusively on office work time and exclude the lunch break period. Participants recorded these times in hours and minutes in both the pre- and post-manipulation surveys (see Appendices N and Q).

Standing up from desk. Standing is one possible non-exercise thermogenic activity (i.e., an activity that does not necessarily qualify as physical activity) that might break up long periods of sitting (i.e., sedentary) time. To measure this behaviour, participants were asked to think about a typical day at the office in the last week (Time 1 survey) or last three days (Time 3 survey) and record the number of times that they stood from their desk during the morning and the afternoon for that day. Participants were asked to think about times they stood for a stretch break, while talking on the phone, etc., and, in order to exclude times during which they had no other choice, include only those times when they intentionally stood up to be active. They also were instructed to NOT include the times captured by the other questions (i.e., walking or using the stairs). Standing was assessed both pre- and post-manipulation (see Appendices N and Q).

Percent sitting time in the office. As a demographic measure of general sitting, in the first survey participants in this study were asked, "Of all of the time you spend at your office on a typical day, how much time do you spend sitting?" Participants answered on an 11-point scale from 0% (none of the time) to 100% (all of the time) (see Appendix N).

Light activity in the office

As light activity that breaks up sitting (i.e., sedentary) time is negatively correlated to sedentary behaviour and is thought to convey health benefits (Healy et al., 2008; Levine et al., 1999), this study also examined measures of light activities that might decrease time spent sitting at a desk at one's office. These included the following:

Walking in the office. Participants were asked to think about a typical day at the office in the last week (Time 1 survey) or last three days (Time 3 survey) and record the number of times that they walked to be active during the morning (i.e., 9am – noon) and afternoon for that day (1pm – 5pm). To establish context, participants were asked to think about times they walked to talk to a colleague rather than calling (or sending an email), or walked during a break. As the goal of this study was to increase intentional light activity, participants were asked to exclude times when they walked because they had no other choice (e.g., to go the washroom, pick up supplies, use the photocopier) unless they walked further than they had to with the intention of

walking to be active. Walking was assessed both pre- and post-manipulation (Appendices N and Q).

Stair use in the office. As another measure of a light activity that could be performed in an office setting (Priebe & Spink, 2012), participants were asked to record the number of times that they used the stairs rather than the elevator to go to another floor in the morning and afternoon of a typical day in the past week. Stair use also was measured pre- and post-manipulation (Appendices N and Q).

Motivations for activity. The manipulation regarding personal similarity involved the tailoring of descriptive norm messages to be about others with "the same" or "different" motivations for being active. While the manipulation conditions were randomly assigned and were not related to participants actual motivations, it was still necessary to collect information about motivations in the first survey so that the subsequent descriptive norm messages could refer back to these motivations. Participants were asked in the first survey to select the best option between two possible categories of reasons for their being active: Health reasons (e.g., for cardiovascular health, to reduce risk of disease, to control weight) or non-health reasons (e.g., to socialize, for appearance, to be challenged, for competition, for enjoyment; see Appendix N). As a point of clarification, participants' answers to this question were not specifically considered in the conditions, as messages for the conditions were tailored to be about others with "the same" or "different" reasons for being active.

Norm perceptions. Three items were used to assess participants' initial perceptions of others' behaviour to predict if the subsequent manipulation messages would have the potential to change perceptions. The norm perception questions asked individual participants, on average, how many times they thought employees in similar offices stood up from their desk, walked to be active within the office, or used the stairs in a typical day. For example, participants were asked, "In order to fit activity into their workday, on average, how many times do you think other employees in offices like yours stand up from their desk in a typical day (do not include times to walk or use the stairs)?" For this question and the walking question, participants were asked to circle the most appropriate answer on a scale with the following options: "Less than once an hour, once an hour, twice an hour, three times an hour, four times an hour, five or more times an hour". The responses for the use of stairs instead of the escalator or elevator ranged

from 0 times a day to 7 or more times a day. Norm perceptions were assessed in the initial survey before participants received any normative information (Appendix N).

Group identity. Eight questions were used to assess group identity with the reference groups referred to in the manipulation messages (Rimal & Real, 2005). These questions were included in a survey sent immediately following the message manipulation (see Appendix P). Four items assessed similarity (e.g., "How similar do you think the other people described in the messages are to you in the way they think?") and four items assessed aspiration (e.g., "I believe the people described in the messages are inspiring"). All questions were answered on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much so). Responses to the eight questions were averaged and the average value was used in the subsequent analyses. Cronbach's alpha revealed the group identity measure was highly reliable ($\alpha = .90$).

Message quality manipulation check. To ensure that the messages were believable, persuasive, relevant, and easy to read, four message quality manipulation check items were assessed following the norm manipulation (e.g., "The information about other's activity was… believable, relevant, easy to read, persuasive"). Responses were made on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (See Appendix Q).

Message receipt and recall manipulation checks. To check recall of the receipt of messages, participants were asked, "Do you recall receiving and reading an email message with information about physical activity in the office within the last few days?" (see Appendix Q). If a "no" response was reported, the participant was excluded from the study. In addition, three questions assessed the participants' recall of the specific details in the messages (e.g., "Was the message about people who had a different or the same reason as you for being active?"). Answers to these three multiple choice questions were analyzed separately for each condition as correct answers depended on message received.

Physical activity. The Godin Leisure-Time Exercise Questionnaire was used to assess overall physical activity participation of participants. This was assessed for demographic purposes (see Appendix N). This questionnaire has demonstrated acceptable reliability and validity (Godin & Shephard, 1985; Jacobs et al., 1993). In accordance with the questionnaire instructions (Godin & Shephard, 1985), participants were asked about their usual weekly leisure-time physical activity in terms of strenuous, moderate, and light activities. The reported values

for these three intensities were multiplied by 9, 5, and 3, respectively, and the products of each of these levels of physical activity were summed to obtain total weekly leisure activity.

In addition to the above measures, demographics (e.g., age, years with company, sex, city of residence) were assessed (see Appendix N). City of residence was included as it set up the contextual component of the similarity manipulation (i.e., messages were about others from "the same" or "different" office/city as participants).

Of note, all measures were piloted with a sample of office workers ($N = 8$). In addition, researchers conferred with representatives of the company where participants were recruited. Company representatives (e.g., senior researcher from department research operations, management) had the opportunity to preview procedures and questionnaires in the early stage of development and offer feedback. The consensus moving forward was that the procedures and measures seemed reasonable and relevant to the population.

4.2.4 Data Analyses

Data were screened for outliers, and variables were checked for normality prior to the main analyses. ANOVA was used to test differences between the four conditions on demographic variables, potential confounding variables (e.g., age, physical activity levels, years with the company), message manipulation checks (e.g., believability), and group identity.

A three-factor repeated measures MANOVA was used to test for time, contextual similarity, and personal similarity. Effect sizes were interpreted as small, medium, or large using values suggested by Cohen (1992). A repeated-measures analysis was deemed appropriate as this study did not include a control group condition and it allowed for participants to serve as their own controls. The within factor (time) compared pre-manipulation to post-manipulation behaviour while the two between factors compared high vs. low contextual similarity and high vs. low personal similarity. The dependent variables were the following behaviours: sitting, standing, walking, and stair use. In the case of a significant omnibus test, univariate main effects were examined for the following hypotheses:

1. Participants' light activity behaviour would increase and sedentary behaviour would decrease from pre- to post- manipulation in response to the descriptive norm messages,

2. Those receiving more contextually similar norm messages would report a greater increase in light activity and decrease in sedentary behaviour when compared to those receiving less contextually similar messages, and
3. Those receiving the more personally similar norm message would report a greater increase in light activity and decrease in sedentary behaviour compared to those receiving less personally similar messages.

4.3 Results

4.3.1 Descriptive Statistics

Data were screened for outliers using histograms and standardized scores. Data were found to be normally distributed with the exception of pre-message manipulation standing, which was kurtotic. As transformation did not improve the distribution, raw scores were used.

In terms of reported reasons for being active, which were used to set up the personal similarity manipulation, 67 participants selected health reasons for being active while 33 participants selected non-health reasons. Participants reported sitting for an average of 82.90% of their workday (SD = 11.01). Means for dependent variables are reported in Table 4.1.

4.3.2 Randomization and Manipulation Checks

Results from an ANOVA testing for differences between the four conditions on demographic variables (e.g., age, physical activity levels, years with company) revealed no differences between conditions for any of the variables, p's > .20. Descriptive data for message quality manipulation checks suggested that the messages were moderately easy to read (M = 4.86, SD = 1.76), believable (M = 4.76, SD = 1.61), relevant (M = 4.64, SD = 1.75), and persuasive (M = 3.82, SD = 1.72; all message quality items measured on 7-point scale ranging from 1 to 7), and there were no differences between conditions, p's > .10.

Confirming that the messages could potentially change participants' perceptions about co-workers' activity and sedentary behaviour, pre-message norm perceptions indicated that participants thought their co-workers were fairly inactive in the office. For example, most participants thought their co-workers either stood up from their desk less than once an hour (the lowest possible response; 47%) or once an hour (34%). Specific frequencies for norm perceptions regarding standing, walking, and stair use are presented in Table 4.2.

Overall participants' ratings of group identity fell above the scale midpoint (M = 38.70 with the highest possible score being 56, SD = 7.06), illustrating that, on average, participants

Table 4.1

Dependent Variables by Condition and Overall

Variable	High Personal/ High Contextual Condition Mean (SD)	High Personal/ Low Contextual Condition Mean (SD)	Low Personal/ High Contextual Condition Mean (SD)	Low Personal/ Low Contextual Condition Mean (SD)	Whole Sample (Used to Assess Time Effects) Mean (SD)
Time 1 Sitting[a]	157.82 (88.43)	187.39 (117.62)	196.59 (113.99)	179.11 (95.48)	180.00 (102.78)
Time 2 Sitting[a]	123.70 (90.62)	141.49 (88.82)	127.09 (75.88)	131.14 (89.61)	130.68 (84.65)
Time 1 Standing[b]	7.37 (5.00)	7.11 (7.34)	6.48 (6.24)	7.66 (6.27)	7.04 (6.20)
Time 2 Standing[b]	6.87 (4.86)	6.87 (7.65)	7.96 (6.15)	10.55 (8.14)	8.18 (6.88)
Time 1 Walking[b]	5.26 (4.17)	6.93 (7.61)	3.75 (3.80)	5.77 (5.90)	5.42 (5.58)
Time 2 Walking[b]	6.74 (5.14)	7.98 (7.64)	6.21 (6.37)	7.36 (6.41)	7.11 (6.35)
Time 1 Stair Use[b]	3.41 (2.58)	3.76 (3.88)	2.44 (2.17)	3.31 (3.74)	3.22 (3.17)
Time 2 Stair Use[b]	3.34 (2.98)	3.83 (4.27)	4.85 (4.67)	4.26 (4.11)	4.12 (4.03)

[a]Sitting was reported as longest sitting period during workday (excluding lunch hour), reported in minutes

[b]Standing, walking, and stair use were reported as number of times during the workday

Table 4.2

Norm Perceptions Regarding Others' Behaviour: Frequencies

Scale	Standing Up From Desk	Walking In Office	Stair Use at Office
Less than once per hour (standing, walking)/0 times per day (stair use)	47%	47%	9%
Once per hour (standing, walking)/ 1-2 times per day (stair use)	34%	31%	79%
Twice per hour (standing, walking)/ 2-3 times per day (stair use)	13%	13%	6%
Three times per hour (standing, walking)/4-5 times per day (stair use)	4%	7%	2%
Four times per hour (standing, walking)/5-6 times per day (stair use)	2%	1%	3%
Five or more times per hour (standing, walking)/7+ times per day (stair use)	1%	0%	1%

seemed to identify with the descriptive norm reference group. As a reference, this mean value is slightly lower than the group identity value found in the other two studies in this thesis but still higher (relative to the scale endpoints) than the mean value found in other normative research examining similar reference group constructs in other areas (e.g., Neighbors et al., 2010; Rimal et al., 2005). No differences emerged between conditions, $p = .52$.

Finally, message receipt manipulation checks revealed that a number of participants had trouble accurately recalling the salient elements of the messages. For the contextual similarity question asking where the people in the messages were from, 56% of participants answered correctly vis-a-vis their condition. For the personal similarity question, 64% of participants answered the question about same or different reasons for being active correctly. In terms of the question as to whether others in the message were more, the same, or less active in the office than them, 71% answered correctly. Across all manipulation check questions, only 38% of participants were able to answer all three questions correctly. The implications of these findings will be discussed in a following section.

4.3.3 Main Analyses

Before running the MANOVA, assumptions specific to this technique (i.e., multivariate normality and homogeneity of covariance matrices) as well assumptions noted previously for ANOVA were checked and met (Tabachnick & Fidell, 2007).

Results from the 2 (time: pre-manipulation vs. post-manipulation message behaviour) x 2 (contextual similarity: high vs. low) x 2 (personal similarity: high vs. low) repeated measures MANOVA only revealed a significant main effect for time, Wilks' $\lambda = .684$, $F(4, 89) = 10.30$, $p < .001$, $\eta_p^2 = .316$. Given the significance of the overall test for the time effect, univariate main effects were examined for each of the four dependent variables (sitting, standing, walking, stair use).

Longest period sitting in the office. Results from the univariate test for longest period of sitting revealed a main effect for time. Supporting hypothesis 1, post-message manipulation sitting ($M = 130.68$ minutes, $SD = 84.65$ minutes) was significantly less than pre-manipulation sitting ($M = 180.00$ minutes, $SD = 102.78$ minutes), $F(1,92) = 32.99$, $p < .001$, $\eta_p^2 = .264$.

Standing at the office. No significant time main effect emerged for the measure assessing standing time while at the office.

Walking at the office. In terms of differences in walking in the office, results revealed a main effect for time. In support of hypothesis 1, differences between pre-message manipulation (M = 5.42 times/day, SD = 5.58 times/day) and post-message manipulation (M = 7.11 times/day, SD = 6.35 times/day) behaviour emerged, with walking behaviour significantly increasing over time, $F(1,92) = 6.01$, $p = .016$, $\eta_p^2 = .061$.

Stair use at the office. Finally, consistent with hypothesis 1, results for stair use behaviour revealed a main effect for time with significant increases between pre- (M = 3.22 times/day, SD = 3.17 times/day) and post-message manipulation (M = 4.12 times/day, SD = 4.03 times/day), $F(1,92) = 7.33$, $p = .008$, $\eta_p^2 = .074$.

Additional analyses based on manipulation checks. Recall that 71% of participants correctly responded to the descriptive norm manipulation check question about the co-workers described in the messages having greater light activity in the office than they did. Of note, the distribution of correct responses was random across groups and there were no significant differences between groups. Interestingly, a MANOVA including only those participants who recalled this part of the message correctly (N = 68) revealed a stronger main effect for time, Wilks' $\lambda = .579$, $F(4, 61) = 11.10$, $p < .001$, $\eta_p^2 = .421$, when compared to the analyses including all participants (N=96). In terms of univariate main effect for time, results of the analyses including only those who accurately recalled the descriptive norm component revealed stronger pre-and post-message norm message time differences for reducing sitting behaviour, $F(1,64) = 37.10$, $p < .001$, $\eta_p^2 = .367$; increasing walking behaviour, $F(1,64) = 5.69$, $p = .020$, $\eta_p^2 = .082$; and increasing stair use, $F(1,64) = 11.29$, $p = .001$, $\eta_p^2 = .150$, when compared to the analyses that included all participants ($\eta_p^2 = .264$, .061, .074, respectively). Although the sample size was considerably smaller (N = 28), implicating power issues, it is worth noting that there were no time effects in those who did not accurately recall the descriptive norm portion of the message manipulation for any of the dependent variables, p's > .20. Further, although there was less power to detect differences in those who did not recall compared to those who did, means seem to indicate greater differences in those who accurately recalled the descriptive norm message.

4.4 Discussion

The purpose of this study was to examine the effect of descriptive norm messages that varied in reference-group similarity (contextual and personal similarity) on sedentary behaviour and light activity in an office setting. Within the constraints of this study, the results revealed

that descriptive norm messages resulted in a change in specific self-report light activity and sedentary behaviours in an office setting. Specifically, although some effects were small, differences emerged between pre-and post-message manipulation for the behaviours of sitting time, walking, and stair use across all participants.

4.4.1 Descriptive Norms, Light Activities, and Sedentary Behaviour

The finding that light activity behaviours changed across all conditions from pre- to post-descriptive norm manipulation is consistent with previous research studies that have found descriptive norms to influence various activity behaviours (e.g., Priebe & Spink, 2012; Studies 1 and 2 of this thesis). In addition, the finding that descriptive norms affected changes in sitting behaviour extends past research to a new health-related behaviour – sedentary behaviour. This is important as sitting behaviour has been identified as one of the best ways to both target change in, as well as operationalize, sedentary behaviour (Chau et al., 2010; Marshall & Ramirez, 2011).

Taken together, the findings that an email field experiment targeting descriptive norms resulted in increased light activities that might break up sedentary time and decreased sitting behaviour adds to the literature on sedentary behaviour. In a review of the area, Chau et al. (2010) identified a lack of successful experiments to change sedentary behaviour, despite the many negative health consequences of this behaviour. Sedentary behaviour has been linked to numerous negative health effects and there is a specific need for research focused on decreasing this behaviour in an office setting (WHO, 2008). Even short two- to three- minute breaks from sitting, such as the time it takes to walk and talk to a colleague rather than send an email, have been linked to health outcomes (e.g., metabolic profile, Gilson et al., 2009), independent of overall activity. Although this experimental study is only a preliminary first step, and requires replication with the inclusion of a control group, it suggests that using descriptive norms delivered via email might hold promise as a possible strategy for future interventions targeting health-related behaviour in an office setting.

As reported in the results, behaviour change across time was seen in the behaviours of walking, stair-use, and sitting, but not in the measure of standing behaviour. One possible reason for this different finding might be that standing may be the most difficult to recall, as it might not be as easily tied to another task like the other behaviours (e.g., walking to talk to a colleague rather than emailing, using the stairs to go to a washroom on another floor, sitting for the

duration of a meeting). Regardless of the reason, it appears that standing behaviour was less prone to change in response to the descriptive norm messages.

4.4.2 Contextual and Personal Similarity

While there was a significant time effect in this study for three of four of the behaviours, an examination of reference group characteristics revealed no difference between conditions varying in high/low personal or contextual similarity, which was unexpected. Based on theory and current empirical findings in other areas, it was hypothesized that high contextual similarity would produce greater behaviour change than lower contextual similarity (e.g., Goldstein et al., 2008) and higher personal similarity would result in greater change than lower personal similarity (e.g., Rimal & Real, 2005).

The failure to find differences between the similarity conditions in this study might simply mean that these factors were not salient in the activity or office setting. Perhaps descriptive norms are effective regardless of the similarity of the reference group in the activity setting. However, the finding in previous research that a strong relationship between descriptive norms and other types of activity behaviour only emerged when norms were framed around specific reference groups (Priebe & Spink, 2011) makes this explanation less tenable.

A more plausible explanation likely relates to the fidelity of the delivered manipulation. Manipulation checks revealed that participants who recalled receiving the messages varied in their recall of the salient reference group similarity information contained in the message. In terms of responses, just over half of the participants were able to accurately recall the contextual similarity information (56%) or the personal similarity information (64%) in their condition. Given that a large number of participants did not accurately recall the information about the reference group similarity relevant to their condition, the present results do not provide a good test of the proposed hypotheses regarding differences due to groups that varied in similarity. It is possible results would be different if participants processed the messages in the way that they were intended. As an aside, examining differences among only those who recalled the contextual or personal manipulation questions correctly was not possible due to the small participant numbers and uneven numbers between conditions in this remaining sample.

4.4.3 Limitations

In terms of limitations, this study was a field experiment and, as such, suffered from some of the typical problems associated with field research. First, a potential reason for the poor

recall of the salient elements of the messages could relate to possible contamination among conditions as all participants belonged to the same office and could have discussed the email messages with one another. Another limitation was that self-report, as opposed to an objective behaviour, was used for the dependent variables. This study aimed to measure everyday activity behaviours that would benefit office workers and decrease the sedentary nature of their workday. Unfortunately, the nature of these behaviours (e.g., standing in the privacy of one's office, length of sitting time) meant that these measures were easiest to capture via self-report as opposed to observed or otherwise objectively recorded. However, there exists a possibility of inaccurate recall and social desirability influencing participants' self-reported behaviour (Baranowski, 1988; Sallis & Saelens, 2000).

A third limitation refers to the fidelity of the manipulation delivery as recall results suggest that proposed differences between reference groups varying in contextual and personal similarity were not processed as intended for many participants. Perhaps the contextual (i.e., different city) and personal (i.e., different reason for being active) factors targeted in the current study were not strong enough to elicit substantial changes from group to group. In all conditions, the reference group was office workers who worked for the same company. It is possible that a stronger manipulation with greater contrast between reference groups would elicit a different behaviour response.

A final limitation relates to the time effect reported in this study, and the fact that there was no control group. Without a control group, it could be suggested that the increase in behaviour from pre- to post-message manipulation was simply due to a Hawthorne effect (Roethlisberger & Dickson, 1939). While this possibility cannot be ruled out completely, there is some support for the likelihood that the time effect was due to the descriptive norm manipulation. Specifically, follow-up analyses revealed pre- to post-message manipulation differences in behaviour among those participants who answered the descriptive norm manipulation question correctly (i.e., thought that the majority of co-workers engaged in activities in the office more than themselves, as indicated by the messages), whereas no differences emerged for those who did not (i.e., either thought the majority of co-workers were the same or less active in the office than themselves). While those who answered the descriptive norm question incorrectly are not a true control group, they do represent a group who did not report the message as delivered, possibly because they did not process the message correctly or

did not open the email containing the message. Norms are thought to work by altering individuals' perceptions (Campo et al., 2004; Schultz et al., 2008). This study aimed to manipulate participants' perceptions about others being more active in the office than themselves by giving all participants a descriptive norm message. If there were no change in perceptions (as seen in those who answered incorrectly), then theory would not predict a change in behaviour. Thus, the finding that mean behaviour changed in those who answered the descriptive norm perception check question correctly and not in those who answered incorrectly provides some support for the suggestion that descriptive norms were the motivator of behaviour in the current study.

4.4.4 Strengths

Despite these limitations, this study also had a number of important strengths. First, the norms presented to participants in the current study were relative to their past behaviour (e.g., "others took the stairs 2 more times than you"). As such, these messages helped to negate the potential for a boomerang effect, in which participants who might already be engaging at or above the level of the norm presented actually decrease their behaviour to comply (Schultz et al., 2007). In addition, the collection of pre-manipulation behaviour from the participants aided in making the norms more believable to participants and allowed the norms to be about similar others (i.e., co-workers) as opposed to generic others.

Though subject to issues associated with self-report measures, the operationalization of sedentary behaviour was another strength of this research. Despite its limitations as a measure of overall sedentary, most studies examining sedentary behaviour have relied on TV viewing (Marshall & Ramirez, 2011). The measure used in this study followed the recommendations of reviews of the area (e.g., Chau et al., 2010; Marshall & Ramirez, 2011) and focused on domain-specific sitting time (i.e., in the workplace) to operationalize sedentary behaviour. Second, and in line with recommendations from these reviews, in attempt to break up sedentary sitting time, this manipulation targeted light activities such as standing, walking, and stair-use, which have been negatively correlated with sedentary time (Healy et al., 2008). Finally, participants were asked to only recall times that they engaged in standing, walking, or stair use behaviour with the intent to be active. Focusing on these specific behaviours that were performed with intention was done in attempt to minimize self-report bias, as general measures of light activity tend to be among the least accurately recalled forms of activity (Sallis & Saelens, 2000).

Other strengths included the use and timing of measures of norm perceptions and manipulation checks. Measuring norm perceptions provided a pre-manipulation assessment of perceptions, which allowed for an understanding of the potential of the normative messages to change individual's subsequent behaviour. Confirming that messages had the potential to change perceptions, initial norm perceptions about office behaviour were much lower than the norms presented in the messages.

Including message manipulation checks proved to be extremely useful. It was reassuring to see that participants reported higher scores in terms of message believability. Further, given the importance of a psychologically meaningful group to norm influence (Hogg & Terry, 2000), group identity was examined as a manipulation check to ensure the reference groups used in the messages would be salient to participants. Consistent with the finding that the messages resulted in a change in behaviour over time, participants reported fairly high group identity with the co-worker reference group in the messages, and there were no differences between conditions. Also, the finding that only 38% of participants correctly answered all manipulation check questions provided some insight into the results of the study. Specifically, the poor recall of the personal and contextual similarity manipulation components of the messages provided one possible explanation for why differences between high and low similarity were not found.

A final strength of this research was the extension of normative research to sedentary behaviour. In light of the negative health consequences of sedentary behaviour and the prevalence of this behaviour, there is a need for research in this area. While there is evidence to support the efficacy of interventions to reduce screen time in youth, interventions focused on sedentary behaviour in adults are lacking (Marshall & Ramirez, 2011). As such, there has been a call for more research aimed at understanding how to reduce sedentary behaviour in adults, and specifically in those with office jobs (Chau et al., 2010). While this study was a field experiment focused primarily on testing theoretical predictions, as opposed to an intervention targeting long-term change in activity and sedentary behaviour in office settings, it might provide some modest insights to inform future research in this area. Despite the poor recall of similarity details, the descriptive norm email messages used in this study appeared to have an effect on self-reported specific light activities and sedentary sitting behaviour over time. This effect was strongest in those who accurately recalled the descriptive norm component of the messages. Further research

is required to understand the potential effects that descriptive norm information may have on activity and sedentary behaviour in office settings.

4.4.5 Future Directions

In terms of other future directions, while the email manipulation was effective in producing changes over time, poor recall of message details likely contributed to the null findings regarding group similarity. In light of the poor message recall, an interesting direction for future research might be to examine ways to increase the effectiveness of messages. In the current study, participants received one email message. Other studies using descriptive norms to influence behaviour have sent multiple messages (e.g., Nolan et al., 2008; Priebe & Spink, 2012), and there is research to suggest that repetition of messages might be more effective than single messages (Brawley & Latimer, 2007; Latimer et al., 2010; Weiss, 1971). The use of multiple messages to examine variations in personal and contextual similarity might be an avenue for future research to explore. Further, it is possible that poor recall of the similarity components of the messages related to the complexity of the messages. A future direction could be to examine the similarity factors independently (context or personal) so that the participants have less information to process.

In conclusion, the findings of the current study provide a very preliminary first step in terms of understanding normative factors that might contribute to decreased sedentary behaviour and increased light activity in an office setting. While the effects did not change for individuals receiving messages about reference groups that varied in similarity, descriptive norm information about others' behaviour did result in an increase in specific light activities and decrease in extended sitting behaviour over time.

CHAPTER 5
GENERAL DISCUSSION

There is a need for research investigating ways in which we might encourage activity and decrease sedentary behaviour in Canadians (Cameron et al., 2007; Marshall & Ramirez, 2011). Suggestions from theory (e.g., Cialdini et al., 1990) and previous research (e.g., Priebe & Spink, 2011; 2012) indicate that norms are one avenue through which positive change in physical activity might be achieved. Three independent, but related experimental studies were conducted in this thesis to examine some unresolved questions in the norms/activity area.

Study 1 examined the effect of descriptive norm messages on muscular endurance behaviour and task self-efficacy in adults. Results revealed higher post-manipulation muscular endurance and higher task self-efficacy levels in participants who received a descriptive norm message about other participants' muscular endurance performance compared to a control condition. In spite of having to perform the second muscular endurance exercise (i.e., a plank hold) after performing a maximal muscular endurance plank just minutes before, participants in the descriptive norm condition actually increased their performance on the second plank while those in the control decreased. The fact that participants increased their muscular endurance under these conditions highlights the potential for descriptive norms to influence physical performance.

In the second study, the effects of injunctive, aligned (matched injunctive and descriptive), and misaligned (mismatched injunctive and descriptive) norm messages on muscular endurance behaviour and task self-efficacy were examined. Results revealed higher post-manipulation muscular endurance and higher task self-efficacy in participants in the aligned norm condition compared to all other conditions, with the misaligned and injunctive not differing from a control condition.

Study 3 used an experimental design to examine the effects of descriptive norm messages sent via email on sedentary and light activity behaviours of office workers. The salience of the norm reference group was manipulated by varying the personal and contextual similarity of the norm reference groups. Findings revealed no differences in conditions that received messages about reference groups varying in contextual or personal similarity. However, results showed a main effect for time, with pre- to post-manipulation differences emerging in three out of the four light activity and sedentary behaviours assessed. Specifically, increases were found in stair-use

and walking in the office while the longest period of sitting time decreased from pre- to post-descriptive norm message delivery.

5.1 Contributions to the Physical Activity Literature

5.1.1 Descriptive Norms and an Objective Activity Performance

The results of this research add to the physical activity literature in a number of ways. Study 1 extended past research by measuring the effects of descriptive norms on objective physical performance versus self-report. This was the first study, to date, that has used an objective measure of a physical activity in the examination of the effectiveness of descriptive norm messages.

5.1.2 Descriptive Norms, Light Activities, and Sedentary Behaviour

Study 3 extended the extant findings to examine the effects of descriptive norms on behaviours that might increase light physical activity in the office. In addition, Study 3 examined another important health behaviour, sedentary behaviour. The examination of sedentary behaviour would appear worthwhile, as this behaviour has been associated with numerous negative health consequences (Biddle et al., 2004; Pate et al., 2008). In addition, individuals in "desk jobs" are most likely to accumulate excessive amounts of sedentary behaviour, best operationalized as sitting time (Chau et al., 2010). Despite the need to examine this behaviour given the sedentary nature of many adults' occupations, most research in the area has focused on TV viewing among children and adolescents, and there has been a lack of successful experimental manipulations influencing sedentary behaviour in adults (Marshall & Ramirez, 2011). In addition, many studies claim to measure sedentary behaviour but typically measure it as the absence of physical activity rather than as sitting time (Marshall & Ramirez, 2011). Study 3 was an important extension of the current literature as it was able to show an effect on sedentary behaviour within an office setting (operationalized as sitting time). Results revealed that descriptive norm messages about co-workers light activity in the office influenced individuals to reduce the length of bouts of continuous sitting. As breaking up sitting time has been related to health, independent of overall activity (Levine et al., 1999), if replicated, this may have important implications for those interested in extending this research to further understand the ways to increase activity or decrease sedentary behaviour in office settings.

5.1.3 Descriptive Norms, Aligned Norms and Task Self-Efficacy

Another extension of past norm research in the physical activity area was the experimental examination of the effect of norms on task self-efficacy. Task self-efficacy has been identified as an important correlate of physical activity performance (e.g., Focht et al., 2005), and the information in a descriptive norm message could potentially provide individuals with a vicarious experience to inform efficacy (e.g., hearing about many similar others engaging in a behaviour might influence one to think, "If they can do it, I can do it too."). Results from Study 1 revealed that task self-efficacy significantly increased from pre- to post-manipulation in those who received the descriptive norm messages. In Study 2, task self-efficacy was highest in the aligned condition (the only condition to contain a positive descriptive norm element) compared to the other conditions.

5.1.4 Injunctive Norms and Activity

Another contribution to the physical activity literature was the examination of injunctive norms, which to date, have received no attention in the activity area. Results from Study 2 revealed the effect of an injunctive norm message on muscular endurance behaviour was no different than a no-message control. Focus theory (Cialdini et al., 1990) predicts that injunctive norms work to alter behaviour because of the social sanctions associated with non-compliance. One suggested reason for the null finding in Study 2 was that injunctive norms might not be effective in the activity setting because sanctions are not in play. Contrast this with behaviours such as environmental conservation, where injunctive norms have been shown to play a larger role (Cialdini, 2003; Reno et al., 1993). Given that the current findings are about one physical performance, however, it would be premature to discount the influence of this type of norm without further investigation.

Further, before discounting the influence of injunctive norms in the activity area, it also can be speculated that that providing the message after engaging in a maximal endurance task depleted self-regulatory resources, which reduced the effectiveness of the injunctive message. This explanation would be consistent with a set of naturalist studies reporting that depletion of self-regulatory resources resulted in decreased conformity to an injunctive norm and increased conformity to a descriptive norm message (Jacobson et al., 2011, Studies 3 and 4). While reasons other than sanctions or self-regulatory depletion could explain the current findings, at the very least, this finding highlights the importance of studying physical activity as a unique

behaviour rather than taking a "one size fits all" to behaviour change (Baranowski, Anderson, & Carmack, 1998). In terms of additions to existing literature, Study 2 also examined the interplay between descriptive and injunctive norms (i.e., aligned or misaligned norms) in the activity area, which has not been examined previously.

5.1.5 Descriptive Norms via Email

A possible application of the current findings concerns the effectiveness of using email to deliver the field experiment manipulation in the third study. Consistent with the suggestion that internet manipulations might be particularly effective in work place settings (Dishman et al., 2009), the use of email to deliver the manipulation messages in Study 3 resulted in an increase in light activities and decrease in sedentary behaviour (i.e., sitting time) in the office setting. However, there is a need for caution here as the results from the manipulation checks in Study 3 suggest that many participants had trouble recalling specific details of the messages and, for the most part, effect sizes were small (see also Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). It is likely that an email manipulation, such as the one used in Study 3, is most effective in producing small immediate changes in specific behaviours while producing long-term behaviour change effects may be more challenging.

5.2 Contributions to Norm Literature and Theory

5.2.1 Differentiating Descriptive and Injunctive Norms

In addition to contributing to research in the physical activity area, the current studies add to the literature on normative influence by differentiating between descriptive and injunctive norms. As Rimal (2008) stresses, too often researchers in the normative area fail to differentiate between types of norms, and instead collapse them into one "norm" variable. As injunctive and descriptive norms can have differing effects on behaviour (Cialdini et al., 1990; Reno et al., 1993), important relationships may go undetected when these norms are not examined separately. Although the reasons are not clear at this point, the results of Study 2 revealed that the effects of injunctive norms on muscular endurance appear to differ from the results seen with descriptive norms and muscular endurance on an identical task in Study 1.

5.2.2 Reference Group Considerations

Another way in which this study aimed to extend past results was by attempting to clarify previously reported conflicting results with both physical (e.g., Priebe & Spink, 2012) and non-physical behaviours (e.g., Polonec et al., 2006). These studies found differing effects with norms

about various reference groups. In line with the idea of salience highlighted by the focus theory, Study 3 proposed that reference group similarity might contribute to the effectiveness of descriptive norms. While differences in reference group similarity did not emerge, a strength of all three studies was that group identity with the reference group was measured. Previous studies producing conflicting results attributed null findings to the possibility of low group identity (e.g., Polonec et al., 2006; Priebe & Spink, 2012), but this variable was not measured in these studies. In the studies of this thesis, group identity was included as a check and it was found to be sufficiently high (e.g., 5 on a 7-point scale), thus eliminating low identity as a possible explanation for the null findings.

5.2.3 Methodological Advancements

This thesis also included other methodological advancements that built upon limitations of previous normative literature:

- Norms were ostensibly created based on actual groups and data collected from this group (e.g., include a time point to establish norms). Implying that norms were created based on a prior survey in a specific group was thought to increase salience of the norms, an important component of focus theory (Cialdini et al., 1990).
- Norm perceptions were assessed. Norms are thought to work by altering normative perceptions (Campo et al., 2004; Rimal, 2008). Thus, assessing pre-manipulation norm perceptions was deemed important to determine whether the norm information provided had the potential to influence perceptions (i.e., are pre-manipulation perceptions different than the norms presented in the subsequent messages?; Schultz et al., 2007). Assessment of pre-message perceptions in the current studies confirmed that the normative messages would differ from the participant's initial perceptions (e.g., not a single participant in Study 1 or Study 2 believed others increased by 20% on their second muscular endurance task, yet the subsequent normative messages were about the majority of others increasing by 20%).
- Believability checks post-message suggested that, while messages differed from pre-manipulation perceptions, participants seemed to accept these messages as true.
- Use of experimental designs including multiple time points. Researchers in the area (e.g., Rimal, 2008) have highlighted the need for more experimental research when examining the effect of norms on behaviour.

5.2.4 Theoretical Underpinning

Another strength of this research was the use of a theoretical underpinning. Focus theory (Cialdini et al., 1990) provided a theoretical framework for all three studies in this thesis. In addition, the efficacy hypotheses in Studies 1 and 2 were consistent with the tenets of self-efficacy theory (Bandura, 1977), and the predictions made in Study 3 regarding reference group similarity were consistent with the social identity approach advocated by Terry and Hogg (1996), which suggests that the norms of a relevant group should influence behaviour when the individual strongly identifies with that reference group. In effect, all three studies tested "proof of principle" in terms of investigating the theoretical tenants of the focus theory as they relate to various activity behaviours.

5.3 Limitations and Future Directions

5.3.1 Injunctive Norms for Activity

While injunctive norms did not impact behaviour in Study 2, it should be made clear that the results of one study should not be used to suggest that this form of norm be jettisoned from future activity research. A reason for the lack of response to injunctive norms suggested in Study 2 was that social sanctions might not exist in the activity area to the same extent as they do in other areas where injunctive norms have been shown to relate to behaviour (e.g., littering and environmental conservation, Cialdini, 2003; Reno et al., 1993). Some examples of possible exceptions to this, however, could be in highly active subgroups or in a sport setting where, on cohesive teams, injunctive norms regarding what players "ought" to do might influence a variety of behaviours related to individual player's activity on the team (e.g., attendance, effort during practices and games).

Another alternative reason injunctive norms did not impact behaviour in Study 2 may have been the timing of the norms that reduced the effectiveness of the injunctive norm message as self-regulatory resources may have been depleted. In one study, results showed that descriptive norms worked better than injunctive norms in a situation when an individual's resources were exhausted (Jacobson et al., 2011). As the muscular endurance task assessed in Studies 1 and 2 was a behaviour that followed a previous maximum-effort muscular endurance task, it might be surmised that the individual's self-regulatory resources were low when the message was delivered. As such, the finding that descriptive norm messages (either alone or in the form of an aligned message) influenced behaviour is consistent with the findings of Jacobson

et al. (2011). To disentangle this effect, it would be important for future research to account for self-regulatory capacities (e.g., the timing associated with the delivery of the normative messages) as well as the importance of sanctions in a given situation (e.g., highly cohesive versus less cohesive sport teams) when attempting to examine the effects of injunctive versus descriptive norm messages.

5.3.2 Reference Group Similarity

Similarity of the reference group is another area that could benefit from further examination. As identified in Study 3, poor recall of the personal and contextual similarity details in the messages was one likely reason for the lack of differences found between groups. A simple advancement might be to replicate the study but attempt to increase message recall through the use of repetitive messages or other techniques such as strengthening the contextual/personal differences or simplifying the messages to focus on one factor at a time (Weiss, 1971).

5.3.3 Norms and Activity for Health Benefits

Another interesting area for future research to explore is the impact of norms on longer-term activity behaviours or maintenance of these behaviours. While the findings of Studies 1 and 2 were significant, there is a need to extend these from an acute to a chronic behaviour. For example, a similar manipulation utilizing messages about others' performance over time could be used to examine the impact on effort or performance over the duration of a multiple-month activity program. The findings of Study 3 suggested changes in specific light activities and sedentary behaviour over a 10-day period. It would be interesting to follow this up in this population by assessing these behaviours over a longer time period. Perhaps the use of multiple messages or follow-up reminders combined with other behaviour change strategies (e.g., self-monitoring) could be used to increase the likelihood participants would maintain the behaviour changes that took place over the course of the field experiment (Latimer et al., 2010).

5.3.4 Additional Comparisons

Participant recruitment and power to test hypotheses is often a factor in research. In all studies, decisions were made regarding the most effective number of conditions to test the research questions posed. As descriptive norms were studied in a similar design in Study 1, it was decided not to include a descriptive norm condition in Study 2. However, this limited the interpretation of the possible reasons why the aligned condition was most effective (e.g., was it

simply the presence of a descriptive norm or was it the combination of norms?). In Study 3, a control condition was excluded as there has already been an assessment of the effect of descriptive norms on activity compared to a control (Priebe & Spink, 2012), and it was deemed acceptable to use participants as their own control by comparing post-message behaviour to initial behaviour. However, the inclusion of a descriptive norm condition in Study 2 and a control group in Study 3 would have strengthened the design and the conclusions that can be drawn from the results.

Further, it could be argued that a limitation of Studies 1 and 2 was the absence of an attention control condition that received a non-normative information message. While a condition of this nature would have ruled out a possible Hawthorne effect due to receiving a message, a no-message control was purposefully chosen for these two studies as previous research in the activity area has examined norm messages relative to an attention control (Priebe & Spink, 2012). As it can be difficult to avoid possible confounding information in an attention control, a future direction suggested in that previous work, was to examine normative messages relative to a no-message control. Further, we take comfort in the observation that the previous work comparing the attention control to descriptive norm messages produced similar results to the descriptive norm to no-message control results found in Study 1 of this thesis.

While measuring norm perceptions pre-manipulation was done deliberately in all three studies, the addition of a post-manipulation measure of norm perceptions might be fruitful. Norms are thought to work by altering perceptions (Campo et al., 2004). In the studies comprising this thesis, it was reasoned that the pre-manipulation measure of norm perceptions and subsequent post-manipulation measure of message believability provided enough information to understand the potential of the messages to influence individuals. However, based on the current measures, one cannot confirm that participants' perceptions changed, even if the message provided was different than their pre-manipulation perceptions and believable. As such, it may be useful for future research to examine changes in norm perceptions in response to activity-related normative messages.

5.3.5 Measure Validity

While the measures used in the three studies comprising this thesis were found to be highly reliable, it should be recognized that all three studies included measures created or adapted for the purposes of these studies. Consequently, validity of these measures could have been an issue. However, in all cases, care was taking to base measures on previous research and recommendations regarding construct operationalization. For example, in Study 3, sedentary behaviour was captured as sitting time as recommended by a number of researchers (e.g., Marshall & Ramirez, 2011).

5.3.6 Generalizability

Another limitation of this research relates to generalizability. In all three studies, the proportion of female participants was higher than the proportion of male participants (Female: 87% Study 1, 68% Study 2, 66% Study 3). As gender differences in the effect of norms on behaviour have been found elsewhere (Campo et al., 2003; Wood-Baker et al., 2003), the generalizability to males would be premature. Notwithstanding this, it is worth noting that the predominantly female sample in Study 1 did not allow for testing of gender differences. Further, post hoc examination of gender differences in Studies 2 and 3 revealed no significant differences.

5.3.7 Norms and Efficacy

Finally, an interesting extension might relate to the examination of efficacy and its role in the descriptive norm-behaviour relationship. As task self-efficacy has been related to activity behaviour (e.g., Focht et al., 2005), and descriptive and aligned norms predicted task self-efficacy in Studies 1 and 2, it is possible that efficacy might offer an indirect pathway through which descriptive norms influence challenging activity behaviour. More research is required to further explore this possibility.

5.4 Conclusion

Taken together, the results of these studies provide preliminary evidence to suggest that:

1. Messages about the behaviour of others (i.e., descriptive norms) can positively influence both self-report and objective physical activity tasks as well as self-report sedentary behaviour,
2. Descriptive norm messages can impact task self-efficacy beliefs and a muscular endurance task,

3. Injunctive norms about others' approval may not be effective in influencing acute muscular endurance activity,
4. Aligned normative messages promoting matched descriptive and injunctive norms seem to be more effective in increasing muscular endurance activity and task self-efficacy than misaligned, injunctive, and control messages, and
5. An email field experiment utilizing descriptive norm messages resulted in increased specific self-report light activities and decrease self-report sedentary behaviour in an office setting.

Future research is needed to continue to examine the effects of the various types of norms and various contextual instances vis-à-vis the effects of normative influence on activity and sedentary behaviour.

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Appendix A – Ethical Approval Certificate Studies 1 and 2

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	BEH#
Kevin Spink	Kinesiology	12-65

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED
University of Saskatchewan

STUDENT RESEARCHER(S)
Carly Priebe

FUNDER(S)
INTERNALLY FUNDED

TITLE
Descriptive Norms and Efficacy for Physical Activity

ORIGINAL REVIEW DATE	APPROVAL ON	APPROVAL OF:	EXPIRY DATE
15-Mar-2012	26-Mar-2012	Application for Approval of Research Project Appendix A – Permission to Recruit Email Appendix B – Recruitment Script Appendix C – Recruitment Poster Appendix D –PAWS/Pilates Email Recruitment Announcement Appendix E – Consent Form Appendix F – PAR-Q Form Appendix G - Initial Survey Appendix H – Task Self-Efficacy for Second Plank Appendix I – Final Survey Appendix J – Debriefing Letter	25-Mar-2013

Full Board Meeting ☒ Date of Full Board Meeting: 15-Mar-2012

Delegated Review ☐

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

Please send all correspondence to:

Research Ethics Office
University of Saskatchewan
Box 5000 RPO University, 1602-110 Gymnasium Place
Saskatoon SK S7N 4J8
Telephone: (306) 966-2975 Fax: (306) 966-2069

Appendix B – Studies 1 and 2 Consent Form

You are invited to participate in a research project examining norms for plank hold time in adults. Please read this form carefully, and **feel free to email or call any of the researchers with any questions** you might have.

Researchers:

Carly Priebe
Doctoral Candidate
College of Kinesiology
University of Saskatchewan
Phone: 966-1099
Email: carly.priebe@usask.ca

Dr. Kevin S. Spink
Professor
College of Kinesiology
University of Saskatchewan
Phone: 966-1074
Email: kevin.spink@usask.ca

Purpose and Procedure: In this study we are interested in examining plank hold time in adults. You will be asked to perform two timed plank hold tests and complete short surveys. The total time commitment is 15 minutes or less. If you agree to participate, your confidentiality is assured because you will not give your name on the surveys and only the researchers will see the completed surveys.

Potential Benefits: All participants will be entered to win a $50 Gift Card from Tim Hortons. Although there are no other known personal benefits to participating in this study, the results of this study will inform researchers and the general public as to reasons for adults' activity behaviors.

Potential Risks: There are no expected physical or psychological risks associated with participating in this study.

Storage of Data: All data will be stored securely at the University of Saskatchewan by the researchers. Only the researchers will have access to the data. No data will be stored on any computer hard drives once the study is complete. The data will be stored for a minimum of five years after completion of the study. This is standard protocol for any data that may be published in an academic journal or presented at a professional conference.

Confidentiality: Participants will not provide their names on the surveys to help assure their privacy. Instead, all participants will be assigned an ID number. Consent forms will be stored separately from surveys. Only the researchers will have access to the raw data to assure confidentiality. Written reports of the results will be expressed in an aggregate/summarized form so that it will not be possible to identify individuals.

Right to Withdraw: Your participation is voluntary. You may withdraw from the research project for any reason, at any time, without penalty of any sort. In order to withdraw from the study, simply tell the research assistant that you wish to do so and you can leave the lab. If you withdraw from the study at any time, any data that you have contributed will be destroyed. In addition, you only need to answer those questions on the surveys that you are comfortable answering.

Questions: If you have any questions concerning the research project, please feel free to contact the researchers at any time at the phone numbers/email addresses provided on the previous page. This research project has been approved on ethical grounds by the University of Saskatchewan's Behavioral Research Ethics Board on (date pending). Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (306-966-2084). Out of town participants may call collect.

PLEASE READ and SIGN YOUR CONSENT

I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I am aware that responses will remain anonymous throughout the study and in any written results of the data collected through participation in this project. I have received a copy of the consent letter for my records.

I, _____ consent to participate in the study described above, understanding that I may withdraw this consent at any time.

Signature _____ Date _____

- -

Appendix C – PAR-Q Form

Physical Activity Readiness
Questionnaire - PAR-Q
(revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
☐	☐	**1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?**
☐	☐	**2. Do you feel pain in your chest when you do physical activity?**
☐	☐	**3. In the past month, have you had chest pain when you were not doing physical activity?**
☐	☐	**4. Do you lose your balance because of dizziness or do you ever lose consciousness?**
☐	☐	**5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?**
☐	☐	**6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?**
☐	☐	**7. Do you know of any other reason why you should not do physical activity?**

If you answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- if you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT _____ WITNESS _____
or GUARDIAN (for participants under the age of majority)

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

CSEP | SCPE

Appendix D – Study 1 Initial Survey

Information About You

1. How old are you? _____years

2. Are you: *(please check one)*
____ Male
____ Female

3. What Pilates class are you currently registered in? _____

4. Number of years you have been taking Pilates classes (including this year)? _____ years

5. Your Physical activity

During a **typical 7-Day period** (a week), how many times on the average do **you** do the following kinds of exercise for **more than 10 minutes** during your free time? *(write on each line the appropriate number)*

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

** Perform Timed Plank Hold #1 **

Appendix E – Study 1 Pre-Message Manipulation Survey

Plank Norms

What do you think happened when others like you (i.e., same age range, gender, and Pilates mat level) performed their second timed plank hold?

Circle the most appropriate answer…

They decreased from their first plank hold time by 40%	They decreased from their first plank hold time by 20%	They decreased from their first plank hold time by 10%	They held the plank for the same time	They increased from their first plank hold time by 10%	They increased from their first plank hold time by 20%	They increased from their first plank hold time by 40%

Confidence for Second Plank Hold

To answer the following questions use this scale:
0% = not at all confident to 100% = completely confident

1. How confident are you that you will be able to come within at least 20% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

2. How confident are you that you will be able to come within at least 10% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

3. How confident are you that you will be able to maintain the same plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

4. How confident are you that you will be able to increase your plank hold time by at least 10% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

5. How confident are you that you will be able to increase your plank hold time by at least 20% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

Appendix F – Study 1 Post-Message Manipulation Survey

Confidence for Second Plank Hold

To answer the following questions use this scale:
0% = not at all confident to 100% = completely confident

1. How confident are you that you will be able to come within at least 20% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

2. How confident are you that you will be able to come within at least 10% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

3. How confident are you that you will be able to maintain the same plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

4. How confident are you that you will be able to increase your plank hold time by at least 10% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

5. How confident are you that you will be able to increase your plank hold time by at least 20% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

Perform Timed Plank Hold #2

Appendix G – Study 1 Final Survey
[Only filled out by those in descriptive norm condition, not control condition]

Group Identity

The following statements refer to the people who were described in the information provided about others' second plank hold times (i.e., others of your age range, gender, and Pilates mat level who did the plank exercises). Please CIRCLE a number from 1 to 7 to indicate your level of agreement with each of the statements.

1. I believe the people of my age range, gender, and Pilates level are respectable.

1	2	3	4	5	6	7
Not At All						**Very Much So**

2. I believe the people of my age range, gender, and Pilates level are inspiring.

1	2	3	4	5	6	7
Not At All						**Very Much So**

3. I look up to most of the people of my age range, gender, and Pilates level.

1	2	3	4	5	6	7
Not At All						**Very Much So**

4. I think highly of the other people of my same age range, gender, and Pilates level.

1	2	3	4	5	6	7
Not At All						**Very Much So**

How SIMILAR do you think the other people of the same age range, gender, and Pilates level are to you?

5. Intellectually?

1	2	3	4	5	6	7
Not At All						**Very Much So**

6. In the way they think?

1	2	3	4	5	6	7
Not At All						**Very Much So**

7.In their values?

1	2	3	4	5	6	7
Not At All						**Very Much So**

8. In their activity behaviours?

1	2	3	4	5	6	7
Not At All						**Very Much So**

Manipulation Check Questions

The below questions refer to the information about others' plank hold times that you received before completing your second plank. Circle the most appropriate answer.

1. The information about others was *aimed at people like yourself*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

2. The information about others was *believable*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

3. The information was *easy to understand*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

4. The information about others was *persuasive*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

Appendix H –Study 1 Debriefing Letter

Kevin S. Spink, Ph.D.
College of Kinesiology, University of Saskatchewan
87 Campus Drive,
Physical Activity Complex
Phone: (306) 966-1074
Email: kevin.spink@usask.ca

Dear Sir or Madam:

Thank you for taking the time to participate in our study on norms for physical activity. It is important that we continue to investigate possible ways that physical activity can be influenced. Your contribution helps us explore how descriptive norms about others' behaviour may influence confidence and subsequent physical activity.

By way of clarification, you were told that the purpose of the study was to establish norms for plank hold time when in reality the purpose was to understand the influence of norms on plank hold time. It is possible that the plank time hold value comparisons that you received about a specific group may have differed from the actual plank hold times of that group. Creating a norm was done to test the hypothesis that the perception of the behaviour of others may influence our own confidence and our own behaviour.

If you are interested in learning more about the findings of this study, we will be pleased to provide a summary to you. To get this summary, please contact me at the address listed above and I will mail the summary to you.

If you have any further questions about the study itself, please feel free to contact me. I would be happy to answer any of your questions.

Once again, thank you for making a valuable contribution to our research.

Sincerely,

Kevin S. Spink, Ph.D.
Professor

Appendix I – Study 2 Initial Survey

Information About You

1. How old are you? _____years

2. Are you: *(please check one)*
____ Male
____ Female

3. What College are you currently registered in? _____

4. Number of years you have been attending university (including this year)? _____ years

5. Your Physical activity

During a **typical 7-Day period** (a week), how many times on the average do **you** do the following kinds of exercise for **more than 10 minutes** during your free time? *(write on each line the appropriate number)*

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

** Perform Timed Plank Hold #1 **

Appendix J – Study 2 Pre-Message Manipulation Survey

Plank Norms

What do you think happened when others like you (i.e., same age range, gender, and college) performed their second timed plank hold?

Circle the most appropriate answer…

They decreased from their first plank hold time by 40%	They decreased from their first plank hold time by 20%	They decreased from their first plank hold time by 10%	They held the plank for the same time	They increased from their first plank hold time by 10%	They increased from their first plank hold time by 20%	They increased from their first plank hold time by 40%

Confidence for Second Plank Hold

To answer the following questions use this scale:
0% = not at all confident to 100% = completely confident

1. How confident are you that you will be able to come within at least 20% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

2. How confident are you that you will be able to come within at least 10% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

3. How confident are you that you will be able to maintain the same plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

4. How confident are you that you will be able to increase your plank hold time by at least 10% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

5. How confident are you that you will be able to increase your plank hold time by at least 20% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

Appendix K – Study 2 Post-Message Manipulation Survey

Confidence for Second Plank Hold

To answer the following questions use this scale:
0% = not at all confident to 100% = completely confident

1. How confident are you that you will be able to come within at least 20% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

2. How confident are you that you will be able to come within at least 10% of your first plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

3. How confident are you that you will be able to maintain the same plank hold time on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

4. How confident are you that you will be able to increase your plank hold time by at least 10% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

5. How confident are you that you will be able to increase your plank hold time by at least 20% on this second attempt?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all Confident										**Completely confident**

Perform Timed Plank Hold #2

Appendix L – Study 2 Final Survey
[Only filled out by those in normative conditions, not control condition]

Group Identity

The following statements refer to the people who were described in the information provided about others' second plank hold times (i.e., others of your age range, gender, and college who did the plank exercises). Please CIRCLE a number from 1 to 7 to indicate your level of agreement with each of the statements.

1. I believe the people of my age range, gender, and college are respectable.

1	2	3	4	5	6	7
Not At All						**Very Much So**

2. I believe the people of my age range, gender, and college are inspiring.

1	2	3	4	5	6	7
Not At All						**Very Much So**

3. I look up to most of the people of my age range, gender, and college.

1	2	3	4	5	6	7
Not At All						**Very Much So**

4. I think highly of the other people of my same age range, gender, and college.

1	2	3	4	5	6	7
Not At All						**Very Much So**

How SIMILAR do you think the other people of the same age range, gender, and college are to you?

5. Intellectually?

1	2	3	4	5	6	7
Not At All						**Very Much So**

6. In the way they think?

1	2	3	4	5	6	7
Not At All						**Very Much So**

7.In their values?

1	2	3	4	5	6	7
Not At All						**Very Much So**

8. In their activity behaviours?

1	2	3	4	5	6	7
Not At All						**Very Much So**

Manipulation Check Questions

The below questions refer to the information about others' plank hold times that you received before completing your second plank. Circle the most appropriate answer.

1. The information about others was *aimed at people like yourself*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

2. The information about others was *believable*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

3. The information was *easy to understand*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

4. The information about others was *persuasive*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

Appendix M –Study 2 Debriefing Letter

Kevin S. Spink, Ph.D.
College of Kinesiology, University of Saskatchewan
87 Campus Drive,
Physical Activity Complex
Phone: (306) 966-1074
Email: kevin.spink@usask.ca

Dear Sir or Madam:

Thank you for taking the time to participate in our study on norms for physical activity. It is important that we continue to investigate possible ways that physical activity can be influenced. Your contribution helps us explore how norms about others' thoughts and behaviour may influence confidence and subsequent physical activity.

By way of clarification, you were told that the purpose of the study was to establish norms for plank hold time when in reality the purpose was to understand the influence of norms on plank hold time. It is possible that the plank time hold value comparisons that you received about a specific group may have differed from the actual plank hold times or thoughts of that group. Creating norms was done to test the hypothesis that the perception of the thoughts and behaviour of others may influence our own confidence and our own behaviour.

If you are interested in learning more about the findings of this study, we will be pleased to provide a summary to you. To get this summary, please contact me at the address listed above and I will mail the summary to you.

If you have any further questions about the study itself, please feel free to contact me. I would be happy to answer any of your questions.

Once again, thank you for making a valuable contribution to our research.

Sincerely,

Kevin S. Spink, Ph.D.
Professor

Appendix N – Ethical Approval Certificate Study 3

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	BEH#
Kevin Spink	Kinesiology	12-23

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED
University of Saskatchewan

STUDENT RESEARCHER(S)
Carly Priebe

FUNDER(S)
INTERNALLY FUNDED

TITLE
Social Norms for Physical Activity

ORIGINAL REVIEW DATE	APPROVAL ON	APPROVAL OF:	EXPIRY DATE
15-Mar-2012	26-Mar-2012	Application or Approval of Research Project Appendix A – Permission to Recruit Email Appendix B – Recruitment Email Appendix C – Consent Form Appendix D – Online Survey 1 Appendix E – Messages Appendix F – Online Survey 2 Appendix G - Online Survey 3 Appendix H – Debriefing Letter	25-Mar-2013

Full Board Meeting ☒ Date of Full Board Meeting: 15-Mar-2012

Delegated Review ☐

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

Please send all correspondence to:

Research Ethics Office
University of Saskatchewan
Box 5000 RPO University, 1602-110 Gymnasium Place
Saskatoon SK S7N 4J8
Telephone: (306) 966-2975 Fax: (306) 966-2069

Appendix O – Study 3 Consent Form

You are invited to participate in a research project examining social norms for physical activity in office workers. Please read this form carefully, and **feel free to email or call any of the researchers with any questions** you might have.

Researchers:

Carly Priebe
Doctoral Candidate
College of Kinesiology
University of Saskatchewan
Phone: 966-1099
Email: carly.priebe@usask.ca

Dr. Kevin S. Spink
Professor
College of Kinesiology
University of Saskatchewan
Phone: 966-1074
Email: kevin.spink@usask.ca

Purpose and Procedure: In this study we are interested in examining physical activity in office workers. It is an online study that you can complete at a location and time that is convenient for you. You will be asked to fill out three short online surveys over the course of one week. Each survey will only take approximately 5-10 minutes of your time. The surveys will include some general demographic questions about yourself and your typical physical activity level and will include questions about the type of activities that you might do at the office on a daily basis. If you agree to participate, your confidentiality is assured because you will not give your name on the surveys and only the researchers will see the completed surveys.

Potential Benefits: All participants will be entered to win a $50 Gift Card from Tim Hortons (one entry per each survey completed). Although there are no other known personal benefits to participating in this study, the results of this study will inform researchers and the general public as to reasons for office worker's activity behaviors.

Potential Risks: There are no expected physical or psychological risks associated with participating in this study.

Storage of Data: All data will be stored in a locked filing cabinet for a minimum of five years in the office of K. Spink at the University of Saskatchewan. Electronic documents will be copied to a memory stick, and will be locked by password in read only format. By doing so, documents cannot be modified without the research password. Only the researchers will have access to the data. No data will be stored on any computer hard drives once the studies are completed.

Confidentiality: Participants will not provide their names on the surveys to help assure their privacy; however, participants will be asked to provide their email addresses for the purpose of matching surveys. Considering that this may allow participants to be identified, ID code numbers will be assigned to the data after the final survey is completed and email addresses will be deleted to ensure that survey responses remain confidential. Only the researchers will have access to the raw data to assure confidentiality. Written reports of the results will be expressed in an aggregate/summarized form so that it will not be possible to identify individuals.

Right to Withdraw: Your participation is voluntary and you only need to answer those questions that you are comfortable with. You may withdraw from the research project for any reason without penalty of any sort. In order to withdraw from the study, simply close your web-browser at any time during the survey. If you withdraw from the study, any data that you have contributed will be destroyed. Your right to withdraw data from the study will apply until May 1, 2012 (results have been disseminated, data has been pooled, etc.). After this it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Questions: If you have any questions concerning the research project, please feel free to contact the researchers at any time at the phone numbers/email addresses provided on the previous page. This research project has been approved on ethical grounds by the University of Saskatchewan's Behavioral Research Ethics Board on (date pending). Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (306-966-2084). Out of town participants may call collect.

Consent to Participate:

I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time.

- ☐ Yes – I consent to participate.
- ☐ Quit – Do not save answers.

Appendix P – Study 3 Online Survey Time 1

Information About You

1. How old are you? _____years

2. Are you: *(please check one)*
____ Male
____ Female

3. What city do you currently live in? _____

4. Number of years you have been an employee with this company? _____ years

5. Your Physical activity

During a **typical 7-Day period** (a week), how many times on the average do **you** do the following kinds of exercise for **more than 10 minutes** during your free time? *(write on each line the appropriate number)*

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking)

Motivations for Physical Activity

People have different reasons for being active. Which one of the following best describes your motivation for being active (pick the best one)?

___ Health reasons (e.g., for cardiovascular health, to reduce risk of disease, to control weight)
___ Non health reasons (e.g., to socialize, for appearance, to be challenged, for competition, for enjoyment)

Activity at the Office

The following questions assess the things that you do be physically active at the office (e.g., using the stairs instead of elevator or escalator, walking to go talk to a colleague, or standing up from your desk).

Stair Use

Think about a typical day at the office in the last week and please answer the following question for **the morning** of that day (i.e., the time between 9am – noon)

Number of times used the stairs to be active: _____
e.g., using the stairs rather than the elevator to go to another floor.

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm)
Number of times used the stairs to be active: _____
e.g., using the stairs rather than the elevator to go to another floor.

Walking

Think about a typical day at the office in the last week and please answer the following question for the **morning** of that day (i.e., the time between 9am – noon).

Number of times walked to be active: _____
e.g., walking to talk to a colleague rather than calling or sending an email, walking during a break. Please do NOT include times when you walked because you had no other choice (e.g., to go the washroom, pick up supplies, use the photocopier unless you walked further than you had to with the intention of walking to be active).

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm)

Number of times walked to be active: _____
e.g., walking to talk to a colleague rather than calling or sending an email, walking during a break. Please do NOT include times when you walked because you had no other choice (e.g., to go the washroom, pick up supplies, use the photocopier unless you walked further than you had to with the intention of walking to be active).

Getting Up From Desk

Think about a typical day at the office in the last week and please answer the following question for **the morning** of that day (i.e., the time between 9am – noon).

Number of times you stood up from your desk during your day at the office: _____

e.g., for a stretch break, while talking on the phone. Include only those times when you intentionally stood up to be active and do NOT include the times captured by the above questions (i.e., walking or using the stairs).

What is the longest period of continuous sitting that you did at one time at the office during the **morning** of that day (i.e., the time between 9am – noon)? _____hours and _____minutes

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm)
Number of times you stood up from your desk during your day at the office: _____
e.g., for a stretch break, getting up to talk to a colleague Include only those times when you intentionally stood up to be active and do NOT include the times captured by the above questions (i.e., walking or using the stairs).

What is the longest period of continuous sitting that you did at one time at the office during the **afternoon** of that day (between 1pm – 5 pm) ? _____hour and _____ minutes

Of all of the time you spend at your office ***on a typical day***, how much time do you spend sitting?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
None of the time								All of the time		

Behaviour of Others

In this study, we are interested in your understanding of the physical activity behaviour of those working in offices like yours.

Select the most appropriate answer…
a) In order to fit activity into their workday, on average, how many times do you think other employees in offices like yours stand up from their desk in a typical day (do not include times to walk or use the stairs)?

Less than once an hour	Once an hour	Twice an hour	Three times an hour	Four times an hour	Five or more times an hour

b) On average, how many times do you think other employees in offices like yours walk to be active within the office (e.g., to go talk to a co-worker, take a break, etc.) in a typical day?

Less than once an hour	Once an hour	Twice an hour	Three times an hour	Four times an hour	Five or more times an hour

c) On average, how many times do you think other employees in offices like yours take the stairs rather than the escalator or elevator to get from floor to floor in a typical day?

0 times a day	1-2 times a day	2-3 times a day	4-5 times a day	5-6 times a day	7 or more times (i.e., every hour)

Please provide your email in the space below so that we can 1) enter you in a draw for the McNally Robinson's gift card and 2) match this survey to the second survey that we will be sending out in about three days.

Email: _____

Note: To ensure confidentiality, ID code numbers will be assigned to the data and email addresses will be deleted so that survey responses remain confidential. Once an email has been replaced by an ID number, it will not be possible to associate an email with any given information on the questionnaire. Only the researchers will have access to the raw data to assure confidentiality. Written reports of the results will be expressed in an aggregate form.

Appendix Q –Study 3 Messages (conditions)

To be sent via email followed by the link to Online Survey Time 2:

High Personal/High Contextual Similarity:
"Results from last week's survey about how workers are being active during the workday are in! Results of employees at **YOUR [company name] head office** revealed that 90% of them who are active for the **SAME MOTIVATIONAL REASON** (health vs. non-health) **that you identified in the survey** reported adding activity to their day by standing up from their desk at least 3 more times than you, took the stairs at least 2 more times than you, and walked around the office at least 2 times more than you in a typical day."

High Personal/Low Contextual Similarity:
"Results from last week's survey about how workers are being active during the workday are in! Results of employees at [company name] offices in **OTHER PROVINCES** revealed that 90% of them who are active for the **SAME MOTIVATIONAL REASON** (health vs. non-health) **that you identified in the survey** reported adding activity to their day by standing up from their desk at least 3 more times than you, took the stairs at least 2 more times than you, and walked around the office at least 2 times more than you in a typical day."

Low Personal/High Contextual Similarity:
"Results from last week's survey about how workers are being active during the workday are in! Results of employees at **YOUR [company name] head office** revealed that 90% of them who are active for a **DIFFERENT MOTIVATIONAL REASON** (health vs. non-health) **than you identified in the survey** reported adding activity to their day by standing up from their desk at least 3 more times than you, took the stairs at least 2 more times than you, and walked around the office at least 2 times more than you in a typical day."

Low Personal/Low Contextual Similarity:
"Results from last week's survey about how workers are being active during the workday are in! Results of employees at [company name] offices in **OTHER PROVINCES** revealed that 90% of them who are active for a **DIFFERENT MOTIVATIONAL REASON** (health vs. non-health) **than you identified in the survey** reported adding activity to their day by standing up from their desk at least 3 more times than you, took the stairs at least 2 more times than you, and walked around the office at least 2 times more than you in a typical day."

Appendix R –Study 3 Online Survey Time 2

Please provide your email in the space below so that we can 1) enter you in a draw for the McNally Robinson's gift card and 2) match this survey to the first survey that you filled out.

Email: _____

Note: To ensure confidentiality, ID code numbers will be assigned to the data and email addresses will be deleted so that survey responses remain confidential. Once an email has been replaced by an ID number, it will not be possible to associate an email with any given information on the questionnaire. Only the researchers will have access to the raw data to assure confidentiality. Written reports of the results will be expressed in an aggregate form.

Group Identity

The following statements refer to the workers that you were compared to in the message (i.e., employees in your office who report the same reasons as you). Please CIRCLE a number from 1 to 7 to indicate your level of agreement with each of the statements.

1. I believe the people in the group that the message was about are respectable.

1	2	3	4	5	6	7
NOT AT ALL					VERY MUCH SO	

2. I believe the people the message was about are inspiring.

1	2	3	4	5	6	7
NOT AT ALL					VERY MUCH SO	

3. I look up to most of the people in the message.

1	2	3	4	5	6	7
NOT AT ALL					VERY MUCH SO	

4. I think highly of the other people in the message.

1	2	3	4	5	6	7
NOT AT ALL					VERY MUCH SO	

How SIMILAR do you think the other people in the group the messages are about are to you?

5. Intellectually?

1	2	3	4	5	6	7
NOT AT ALL						VERY MUCH SO

6.In the way they think?

1	2	3	4	5	6	7
NOT AT ALL						VERY MUCH SO

7.In their values?

1	2	3	4	5	6	7
NOT AT ALL						VERY MUCH SO

8. In their activity behaviours?

1	2	3	4	5	6	7
NOT AT ALL						VERY MUCH SO

Appendix S – Study 3 Online Survey Time 3

Activity at the Office

The following questions assess the things that you did to be active in the office during the last two days (e.g., using the stairs instead of elevator or escalator, walking to go talk to a colleague, or standing up from your desk).

Stair Use

Of the last 2 days (since receiving the email message), pick the office day that was most typical in terms of your work commitments and please answer the following question for **the morning** of that one day (i.e., the time between 9am – noon)

Number of times used the stairs to be active: _____
e.g., using the stairs rather than the elevator to go to another floor.

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm)
Number of times used the stairs to be active: _____
e.g., using the stairs rather than the elevator to go to another floor.

Walking

Think about the office day that was most typical in terms of your work commitments in the last two days (since receiving the email message) and please answer the following question for **the morning** of that day (i.e., the time between 9am – noon)

Number of times walked to be active: _____
e.g., walking to talk to a colleague rather than calling or sending an email, walking during a break. Please do NOT include times when you walked because you had no other choice (e.g., to go the washroom, pick up supplies, use the photocopier unless you walked further than you had to with the intention of walking to be active).

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm)

Number of times walked to be active: _____
e.g., walking to talk to a colleague rather than calling or sending an email, walking during a break. Please do NOT include times when you walked because you had no other choice (e.g., to go the washroom, pick up supplies, use the photocopier unless you walked further than you had to with the intention of walking to be active).

Getting Up From Desk

Think about the office day that was most typical in the last two days (since receiving the email message) and please answer the following question for **the morning** of that day (i.e., the time between 9am – noon)

Number of times you stood up from your desk during your day at the office: _____
e.g., for a stretch break, while talking on the phone. Include only those times when you intentionally stood up to be active and do NOT include the times captured by the above questions (i.e., walking or using the stairs).

What is the longest period of continuous sitting that you did at one time at the office during the **morning** of that day (i.e., the time between 9am – noon)? _____hours and _____minutes

Please answer the following questions for the **afternoon** of that day (1pm – 5 pm.
Number of times you stood up from your desk during your day at the office: _____
e.g., for a stretch break, getting up to talk to a colleague Include only those times when you intentionally stood up to be active and do NOT include the times captured by the above questions (i.e., walking or using the stairs).

What is the longest continuous period of continuous sitting that you did at one time at the office during the **afternoon** that day (between 1pm – 5 pm)? _____hour and _____ minutes

Manipulation Check Questions

1. Do you recall receiving and reading an email message about physical activity in the office within the last few days?
Yes/ No

The below questions refer to the message about physical activity that you received a few days ago.
1. The information in the message was *aimed at people like yourself*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

2. The information in the message was *believable*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

3. The message was *easy to read*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

4. The information in the message was *persuasive*.

1	2	3	4	5	6	7
Strongly Disagree						**Strongly Agree**

5. Who (i.e., what group of people) was the message about?
a) [company name] office workers
b) Workers in other companies
b) [company name] employees in other provinces
d) [city name] citizens

6. Was the message about people who had a different or the same reason as you for being active?
a) People with a <u>different</u> reason for being active than you
b) People with the <u>same</u> reason for being active as you

7. Was the group in the messages more or less active at work than you?
a) More active at work than you (i.e., used the stairs, walked, and stood more than you)
b) Less active at work than you (i.e., used the stairs, walked, and stood less than you)
c) The same as you (i.e., used the stairs, walked, and stood the same amount as you)

Please provide your email in the space below so that we can 1) enter you in a draw for the McNally Robinson's gift card and 2) match this survey to the first survey that you filled out.

Email: _____

Note: To ensure confidentiality, ID code numbers will be assigned to the data and email addresses will be deleted so that survey responses remain confidential. Once an email has been replaced by an ID number, it will not be possible to associate an email with any given information on the questionnaire. Only the researchers will have access to the raw data to assure confidentiality. Written reports of the results will be expressed in an aggregate form.

Appendix T –Study 3 Debriefing Letter

Kevin S. Spink, Ph.D.
College of Kinesiology, University of Saskatchewan
87 Campus Drive,
Physical Activity Complex
Phone: (306) 966-1074
Email: kevin.spink@usask.ca

Dear Sir or Madam:

Thank you for taking the time to participate in our study on social norms for physical activity. It is important that we continue to investigate possible ways that physical activity can be influenced. Your contribution helps us explore how social norms may influence physical activity in office workers.

We also would like to let you know that we sent the same standardized message about activity of office workers to all participants. As such, it is possible that the activity value comparisons that you received about either your co-workers or other office workers for walking, using the stairs, and getting up from their desk may have differed from those that your co-workers actually reported. This was done to test our hypothesis that our perception of the behaviour of others may influence our own behaviour.

If you are interested in learning more about the findings of this study, we will be pleased to provide a summary to you. To get this summary, please contact me at the address listed above and I will mail the summary to you.

If you have any further questions about the study itself, please feel free to contact me. I would be happy to answer any of your questions.

Once again, thank you for making a valuable contribution to our research.

Sincerely,

Kevin S. Spink, Ph.D.
Professor

CURRICULUM VITAE

Carly Priebe

carly.priebe@usask.ca

ACADEMIC CREDENTIALS

Doctor of Philosophy – Kinesiology 2009 - 2013
University of Saskatchewan, Saskatoon, SK
- Maternity leave (8 months) 2012
- Convocation: May 2014

Master of Science – Kinesiology 2007 - 2009
University of Saskatchewan, Saskatoon, SK

Bachelor of Science Honours – Kinesiology 2003 - 2007
University of Saskatchewan, Saskatoon, SK
- Minor Nutrition

HONOURS

MAJOR AWARDS

SSHRC Vanier Graduate Scholarship 2009-2012

University of Saskatchewan Graduate Thesis Award 2010

University of Saskatchewan Dean's Scholarship 2008-2009

SSHRC CGS Masters Award 2007-2008

College of Kinesiology Dean's Medal 2007
- Awarded at convocation to top graduate in College

OTHER HONOURS

1st Place Poster Winner at University of Saskatchewan's Life & Health Sciences Research Day 2009, 2013

Wolfe Family Graduate Student Scholarship 2013

George and Arlene Loewen Family Bursary 2013

1st Place Research Presentation, Kinesiology Research Day 2013

U of S Graduate Student Association Bursary 2013

CUPE 3287 Sessional Lecturer Professional Development Fund 2013

College of Graduate Studies & Research Tuition Scholarship 2008-2012

College of Kinesiology Tri-Council Top Up 2008-2012

3rd Place Poster Winner at University of Saskatchewan's Life & Health Sciences Research Day 2012

College of Graduate Studies & Research Travel Award 2009, 2010, 2011

College of Kinesiology Dean's Travel Award 2008, 2009, 2010

University of Saskatchewan Entrance Scholarship 2003 – 2006

Kinesiology Undergraduate Academic Award for Third Year 2006
- Awarded to two students with the highest academic averages of third years in the College of Kinesiology

CUPE 1975 Norm Quan Memorial Bursary 2004, 2006

University of Saskatchewan Gord Garvie Memorial Scholarship 2004, 2006

University of Saskatchewan Scholarship 2006

Kinesiology Undergraduate Academic Award for Second Year
- Highest academic average of second year Kinesiology students at the University of Saskatchewan 2005

University of Saskatchewan Marian Evans Younger Memorial Scholarship 2005
- In recognition of leadership qualities, participation in school and community organizations, demonstrated interest and contributions in service to society, and academic achievement

University of Saskatchewan John Labatt Scholarship
- In recognition of academic achievement, leadership qualities and contributions to student activities 2005

Heather Jean Dawe Prize
- Highest academic average of first year Kinesiology students at the University of Saskatchewan 2004

Ron Moe Memorial Bursary 2004

John Spencer Middleton & Jack Spencer Gordon Middleton Scholarship 2004

Canadian Association for the Advancement of Women in Sport & Physical Activity (CAAWS) Stacey Levitt Memorial Scholarship 2004

- This national scholarship recognizes "inspirational young female role models for their commitment to sport and community"

University of Saskatchewan College of Kinesiology Academic Honour Roll 2003 - 2007

University of Saskatchewan's Greystone Scholars Society 2003 - 2007

- Includes Greystone's Scholar Scholarship

Golden Key International Honour Society 2004, 2005, 2006

- Invited to join this society for being in the top 15% of undergraduate students at University of Saskatchewan

Saskatchewan Learning General Proficiency Award 2003

- In recognition of superior scholastic achievement

PUBLICATIONS

PAPERS IN REFEREED JOURNALS

PUBLISHED:

Priebe, C. S. & Spink, K. S. (2012). Using messages promoting descriptive norms to increase physical activity. *Health Communication, 27*, 284-291.

Priebe, C. S., Flora, P. K., Ferguson, L. J., & Anderson, T. J. (2012). Using efficacy information to manipulate proxy efficacy in novice exercisers. *Psychology of Sport & Exercise, 13*, 562-568.

Ennis, K., Priebe, C., Sharipova, M., & West, K. (2012). Broadening horizons: Examining creative approaches in writing teaching philosophy statements. *CELT (Collective Essays on Teaching & Learning*), 5, 172-178.

Priebe, C. S. & Spink, K. S. (2011). When in Rome: Descriptive norms and physical activity. *Psychology of Sport & Exercise, 12*, 93-98.

Wilson, K. S., Spink, K. S., & Priebe, C. S. (2011). Self-regulatory efficacy and activity: Examining gradations of challenge. *Psychology of Sport & Exercise, 12*, 579-582.

Spink, K. S., Wilson, K. S., & Priebe, C. S. (2010). Groupness and adherence in structured exercise settings. *Group Dynamics, 14*, 163-173.

Wilson, K. S., Spink, K. S., & Priebe, C. S. (2010). Parental social control and child's activity lapse: Role of parental activity and importance. *Psychology of Sport & Exercise, 11*, 231-237.

UNDER REVIEW:

Priebe, C. S. & Spink, K. S. (submitted). Blood, sweat, and the influence of others: The effect of descriptive norms on muscular endurance and task self-efficacy. Submitted to *Psychology of Sport & Exercise*.

IN PREPARATION:

Priebe, C. S. & Spink, K. S. (in preparation). Effects of descriptive norm messages on sedentary behaviour and light activity in office workers: A field experiment.

Priebe, C., Ennis, K., Sharipova, M., & West, K. (in preparation). Using arts-based research methodology to understand teachers' experiences in creating teaching philosophies.

Priebe, C. S. & Spink, K. S. (in preparation). Descriptive norms for healthy eating: Effect of reference groups.

Priebe, C. S., Spink, K. S., Fesser, K., Crozier, A., & Ulvick, J. (in preparation). Effects of injunctive, aligned, and misaligned norm messages on activity.

PAPERS IN PUBLISHED CONFERENCE PROCEEDINGS & ABSTRACTS

Priebe, C.S. & Spink, K. S. (2013). "If they can, so can I": Descriptive norms, efficacy, and activity. *Journal of Sport & Exercise Psychology, 35,* S109.

Priebe, C.S., Spink, K. S., Fesser, K., Crozier, A., & Ulvick, J. (2013). Social norms and activity: Is what you think others believe important? *Journal of Sport & Exercise Psychology, 35,* S110.

Viglietta, R. C., Wilson, K. S., Spink, K. S., Ulvick, J. D., Priebe, C. S & Crozier, A. J. (2012). Would I come back? The role of groupness and cohesion in intention to return. *Journal of Sport & Exercise Psychology, 34*, S297.

Ulvick, J.D., Crozier, A.J., Spink, K.S., Wilson, K.S., & Priebe, C.S. (2012). Understanding groupness: Exploring the effects of perceived cohesion and similarity. *Journal of Sport & Exercise Psychology, 34*, S295.

Crozier, A.J., Spink, K.S., Wilson, K.S., Ulvick, J.D., & Priebe, C.S. (2012). "All for one": Examining the effects of cohesion and groupness on adherence in structured exercise settings. *Journal of Sport & Exercise Psychology, 34*, S219.

Priebe, C.S., Spink, K. S., & DeRoo, T. (2011). An exploratory study examining groupness, cohesion and satisfaction in an exercise setting. *Journal of Sport & Exercise Psychology, 33*, 179-180.

Robinson, B., Priebe, C.S., & Spink, K. S. (2011). Is it what I say or what others do? Correlates of effort in young athletes: An exploratory study. *Journal of Sport & Exercise Psychology, 33*, 181.

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Wilson, K.S., Spink, K. S., & Priebe, C. S. (2010). Self-regulatory efficacy and activity: Examining gradations of challenge. *Journal of Sport & Exercise Psychology, 32*, 232-233.

Priebe, C. S., Spink, K. S., Wilson, K. S., & Hobman, K. S. (2009). 'When in Rome': Using normative information to increase physical activity in office workers. *Journal of Sport & Exercise Psychology, 31*, 133-134.

Priebe, C. S., Spink, K.S., Wilson, K. S., & Hobman, K. S. (2009). Normative social influence for physical activity: Who wants to be a follower? *Journal of Sport & Exercise Psychology, 31*, 134.

Flora, P., Priebe, C., Besenski, L., Anderson, T., & Gyurcsik, N. (2009). Using efficacy information to influence proxy efficacy in novice exercisers. *Journal of Sport & Exercise Psychology, 31*, 119.

Wilson, K. S., Spink, K. S., & Priebe, C. S. (2009). Staying the course or riding the waves: Exploring adolescent physical activity and parental social influence. *Journal of Sport & Exercise Psychology, 31*, 144.

Wilson, K., Spink, K.S., & Whittaker, C. (2008). Support versus control: Parent and adolescent views of social influences following a physical activity lapse. *Journal of Sport & Exercise Psychology, 30*, 211-212.

Wilson, K., Spink, K.S., & Whittaker, C. (2008). To nag or not to nag: When do negative parental influences predict adolescent activity behavior? *Journal of Sport & Exercise Psychology, 30*, 212.

Wilson, K. S., Spink, K. S., & Whittaker, C. (2007). Parental response to lapses in child's physical activity: To control or not to control. *Journal of Sport & Exercise Psychology, 29*, 217.